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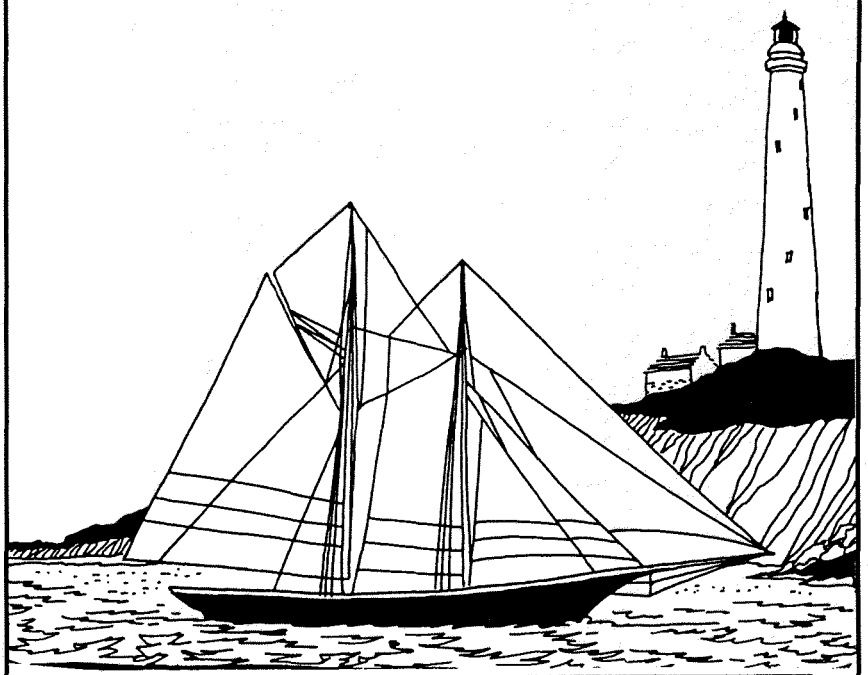

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About this issue . . .

I hope this issue covers some new territory of interest, from an ethnographic analysis of a North Carolina creationist network-cum-community to an excursion in the history of science for a rounded look at flat-earth science and what it can teach us about scientific methods and misunderstandings.

An article by a scholar trained in religion (as a rabbi) and science examines the creationist "appearance of age" argument as a false explanation of theology as well as of the Earth's geology and fossils. The infamous "Piltdown Hoax" is shown to offer good lessons about science, not just embarrassment, and Australian Barry Price replies to an earlier criticism of his style of debating creationists; this will end coverage of this debate in these pages. Interested parties should consult the people involved for more information, if desired. A review article by the NCSE Executive Director puts on trial the recent book, *Darwin on Trial* which is being used by creationists as the current leading weapon in their assault on evolution education.

John R. Cole

Two corrections to the previous issue should be noted. The article "Life: How It Got Here: A Critique of a View from the Jehovah's Witnesses" (*C/E* 30: 29–34) should have been credited to Malcolm P. Levin **with Jack B. Lord, Royal Botanical Garden, Toronto, Ontario**; the second author was omitted, and we apologize.

"Evolution's Hidden Agenda—Revealed!," by Arthur Shapiro (*C/E* 30: 22–28), omitted a bibliographic entry referred to in the text: Christopher Toumey's 1987 North Carolina dissertation, "The Social Context of Scientific Creationism."

The first error was the result of my violating a prime rule of editing which states that the most likely place for error is in a headline, title or caption; these have to be typeset differently than text, and they can too easily be taken for granted in proof-reading rather than scanned as critically as text material in search of mutant copy. This is an explanation but no excuse.

I apologize for the oversights. *JRC*

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Creation/Evolution

Volume 12 • No. 2 • Winter 1992

The journal of evolution and science education which explores aspects of evolution and antievolutionism

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Creation/*Evolution*

12(2), Issue 31, Winter 1992
ISSN 0738-6001
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Address editorial correspondence to the editor. Style guidelines are available from the editor or publisher; 3 copies of unsolicited mss. are requested so that copies may be sent to referees, and return postage should be included if return of the ms. is desired. Write the publisher about address changes, missing issues, multiple issue or back issue purchases, reprint rights, etc.

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Looking for Lighthouses

Robert J. Schadewald

The toolkit of the obscurantist is limited. As a result, a few themes and modes of argument tend to recur whenever well-founded views are systematically attacked. A 19th century argument about lighthouses illustrates this fact and illuminates a central apologetic method of modern creation science.

Sometime in 1868, an itinerant lecturer who called himself "Parallax" gave a series of evening lectures on "Zetetic Astronomy" in the ancient Roman city of York, 180 miles north-northwest of London. The lecturer's real name was Samuel Birley Rowbotham. Zetetic astronomy was a flat Earth system he had largely invented, and he had then been promoting it in public lectures for nearly two decades. *Zetetic Astronomy: Earth Not a Globe* was also the subject of his 221-page book (Rowbotham, 1865). In his book and in his lectures, "Parallax" (Rowbotham) made a simple, basic argument: If the Earth is globe, you can throw out your Bible. He bolstered this claim with many arguments from the natural world, some of them involving lighthouses.

Reverend M. R. Bresher, vicar of St. Martin's in Coney-street, York, found out about the flat-Earth lecture series only after the fact. Reverend Bresher, who had an M.A. from Cambridge, knew some astronomy, and he was concerned because "many of those who listened to the Lecturer's fervid denunciations of the newtonian system as utterly absurd in itself, and subversive of all belief in the inspiration of the Bible, seem to have been carried away by his declamation, and to have become converts to his system." Obtaining a copy of *Zetetic Astronomy*, Reverend Bresher studied it carefully and then wrote a detailed rebuttal entitled *The Newtonian System of Astronomy; with a Reply to the Various Objections Made Against it by "Parallax"* (1868).

As suggested previously, Rowbotham used the same tactics to sell zetetic astronomy that Henry Morris uses to sell creation science. He raised various objections against the conventional view to cast doubt on the competence, veracity, and motives of scientists and then hit listeners (and readers) with the

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Biblical hard sell. This was just as effective at a mid-19th century flat-Earth lecture as it is at a late-20th century "Back to Genesis" seminar. Moreover, unlike modern creation science, zetetic astronomy was not just smoke and mirrors. Rowbotham really did have a (relatively) coherent alternative to the conventional view, and he set forth his system in his book and his lectures.

The details of zetetic astronomy and Reverend Bresher's dissection of it need not concern us here. We will discuss only Rowbotham's arguments based on lighthouses.

Before the days of electronic navigation systems, lighthouses were vitally important to mariners. Standard navigation references (such as Bowditch) contained detailed descriptions of the locations, characteristics, and visibility of the most important lights. Navigation charts showed the exact positions of all lighthouses, and local pilotage guides listed all lights in a given area. Besides these, the standard English-language reference was known as *Lighthouses of the World* (Findlay, 1862). Rowbotham made extensive use of *Lighthouses of the World*, as the following quotation illustrates:

> This conclusion [that the Earth is flat] is greatly confirmed by the experience of mariners in regard to certain lighthouses. Where the light is fixed and very brilliant it can be seen at a distance, which the present doctrine of the Earth's rotundity would render altogether impossible. For instance, at page 35 of "Lighthouses of the World," the Ryde Pier Light, erected in 1852, is described as a bright fixed light, 21 feet above high water, and visible from an altitude of 10 feet at the distance of 12 nautical or 14 statute miles. The altitude of 10 feet would place the horizon at the distance of 4 statute miles from the observer. The square of the remaining 10 statute miles will give a fall or curvature downwards from the horizon of 66 feet. Deduct from this 21 feet, the altitude of the light, and we have 45 feet as the amount which the light ought to be *below the horizon!*

Rowbotham's calculation is correct, although he made no allowance for atmospheric refraction. But even deducting 1/7 of the dip for refraction (a generous correction) does not solve the problem for sphericity. Rowbotham went on:

> By the same authority, at page 39, the Bidston Hill Lighthouse, near Liverpool, is 228 feet above high water, one bright fixed light, visible 23 nautical or very nearly 27 statute miles. Deducting 4 miles for the height of the observer, squaring the remaining 23 miles and multiplying that product by 8 inches we have a downward curvature of 352 feet; from this deduct the altitude of the light, 228 feet, and there remains 124 feet as the distance which the light should be *below the horizon!*

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Again, Rowbotham's arithmetic is correct, and even a generous correction for atmospheric refraction cannot solve the problem for sphericity. Rowbotham gave about 20 such examples in *Zetetic Astronomy*, and he averred that "many other cases could be given from the same work, shewing that the practical observations of mariners, engineers, and surveyors entirely ignore the doctrine that the earth is a globe."

Suspicious reader that you are, you probably wonder whether Rowbotham cited *Lighthouses of the World* correctly. Bresher wondered, too. When he consulted the work, however, he found that the published numbers were exactly as Rowbotham stated them. But that was not the whole story. Bresher noted:

> I have carefully looked over the book alluded to, and find that out of above 2000 cases, the few selected by "Parallax" are nearly the whole that do not verify the truth of the doctrine in question. And what do these few, about thirty out of upwards of 2000, prove?

An excellent question. Before considering it, we should note another of Bresher's discoveries:

> [W]hile "Parallax" was attentively scanning the "Lighthouses of the World" to find out some that could be seen *farther* than they ought to be seen, on the supposition that the earth is a globe of about 25,000 miles in circumference; he could not but find many more which *cannot be seen as far* as they ought to be, on the above supposition . . .
>
> The proper conclusion from the above facts is, that either there is a misprint in the book at these places, or that the localities where these lighthouses are situated possess some peculiarities which, if known, would account for these deviations. For it is a monstrous assertion which "Parallax" makes . . . that one single instance, like the one he mentions, entirely destroys the doctrine of the earth's rotundity.

Well said, Reverend Bresher!

Rowbotham, of course, was neither the first nor last to promote the 1.5% of the data that supported his position while ignoring the 98.5% that contradicted it. This technique is the common property of those determined to convince others of their position by whatever methods they find expedient. Thus, many creationist evangelists comb the scientific literature trying to find things that don't seem to fit the conventional view. Then they present these anomalies to the public as representative, just as Rowbotham presented his anomalous lighthouses.

Looking for lighthouses is, of course, easier than trying to construct a creation model. Despite assertions to the contrary, no predictive "creation

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model" of the biological world exists. For years, I have been asking prominent creationists to tell me what the creation model is and on what scientific basis it accounts for homologous structures, molecular phylogenies, and so forth. The silence has been deafening. Like a lonely child's imaginary friend, the creation model is much talked about but never actually presented for inspection. In this respect, flat Earthism is better science than creationism. The flat-Earth model is real (Schadewald, 1989), and no prominent flat Earther was ever struck dumb when asked to say what it is.

And what about Rowbotham's anomalous lighthouses?

Beats me.

Perhaps the reported observations were made under unusual conditions. Perhaps, for those lighthouses still operating, new observations would not confirm the reported anomalies. By now, however, some of Rowbotham's lighthouses presumably have been closed, torn down, or destroyed by the elements. For these, we will never know. One thing is certain; those who seek only anomalous lighthouses will never find light.

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Creationism and Appearance of Age—Is Anybody Really Anywhere?

Michael Oblath

The creationist concept that the universe was created with an appearance of age is falsifiable and would indicate, if true, that most of what we perceive as real does not exist. In the continuing evolution/creation battle the notion of a "theory" is often the innocent victim. Creationists approach the struggle aggressively. Their intent is to attack evolution, to indicate possible holes, gaps or other difficulties in the theory. Although that very process is verification that evolution is indeed a theory, the creationists' arguments actually twist the truth. Evolution becomes a belief, creationism becomes a science. We are inundated with a bizarre collection of pseudoscience, misquotes, statistics and religious dogma. The effect on the unsophisticated is noteworthy. Those untrained in biblical and/or scientific study can be easily convinced that creationism has a greater right to be considered a more workable theory of origins than does evolution. Indeed, creationism is presented as the only workable theory.

Rarely, if ever, does the creationist permit a test of creationist belief. It is true that the existence of a Creator cannot be tested or falsified. The functional model for creationism, however, is to be found in the Hebrew Bible. The pertinent biblical texts actually can be held accountable for the claims made on their behalf by creationists. They are falsifiable.

The Bible's two primary creation stories are the Creation account itself in *Genesis* 1 and the garden of Eden story in *Genesis* 2 and 3. When examined closely these stories reveal two basic types of contradictions. There are biblical passages which contradict scientific knowledge, even knowledge accepted by the creationists.

Examples of contradictions within the text are as follows:

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1. *Gen* 1:5 clearly states that the light created on Day 1 is the light which divides day from night—"God called the light Day, and the darkness He called Night. And there was evening and there was morning, a first day." This light is without doubt the light we perceive during Earth's daytime hours. Thus, the Sun is not responsible for daylight.
   On Day 4, however, this notion is clearly contradicted, as stated in verse 15; ". . . and they (sun, moon and stars) shall serve as lights in the expanse of the sky to shine upon the earth."
2. The well-known contradictions between the Creation story and the beginning of the Garden of Eden story are revealing. The relevant sequence from *Genesis* 1 is: Day 3—vegetation; Day 5—fish and birds; Day 6—land animals and humans (man and woman are created together in one verse, *Genesis* 1:27).

In fact, what is generated on each day forms an interesting pattern:

Day 1: light	Day 4: sun, moon and stars
Day 2: sky, seas	Day 5: birds, fish
Day 3: land, vegetation	Day 6: land animals, humans

Besides a horizontal, poetic "evolution" of Day 1 to Day 4, Day 2 to Day 5, and Day 3 to Day 6, both vertical columns can also be categorized. On Days 1, 2 and 3 only inanimate objects are created, except for vegetation. On Days 4, 5 and 6 only animate objects are created. Vegetation is both inanimate and animate and is centrally located. This then, would be an Israelite representation (c. 600 b.c.e.) of the structure of the world/universe as they perceived it. *Genesis* 1 progresses from "chaos" to "order," an Aristotelian-like order (several centuries prior to Aristotle) dividing the universe into animate and inanimate objects.[1]

The Garden of Eden story, on the other hand, begins with this sequence of creative events:

Man
Vegetation
Animals
Woman

If the integrity of *Genesis* 1:27 is to be maintained then the Garden of Eden account must have taken place during Day 6, and in the entire span of one verse. Yet, how then could the sequencing of *Genesis* 1 be supported? It is quite obvious that these two creation accounts are irreconcilable.

More relevant to areas of scientific interest are the contradictions which derive from our knowledge of the universe. Several of these are:

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1. Vegetation is created on Day 3. According to the Hebrew text (1:12) these plants are fully grown, "*watose*." They cannot survive without the Sun, yet the Sun is not created until Day 4.
2. According to most scholars today, the fossil evidence strongly supports the evolutionary pattern that birds evolved from dinosaurs. In *Genesis* 1, however, birds are created on Day 5 while dinosaurs, although not mentioned specifically, are to be included with the land animals on Day 6;
3. As previously implied, daylight is created on Day 1 without benefit of its source, the Sun; and,
4. The entire universe beyond earth was created on Day 4. According to creationists the approximate age of the Universe is 10,000 years. We should be unable to see any stars or other astronomical objects which are farther that 10,000 light years distant. Our ability to see beyond this distance contradicts the biblical notion of a young Universe.

Not to be outdone, however, creationists have rationalized several of these contradictions by developing an idea known as "appearance of age." In dealing with the existence of plants, for example, the argument reads as follows: plants, need water, soil, light and chemical nutrients in order to live. Prior to vegetation's creation on Day 3, soil, water and light were all present.[2] The chemical nutrients necessary for proper growth, though, require a long period of time to develop in the soil. We know from Genesis 1 that plants were created fully mature, so the nutrients must also have been created instantaneously in the soil. Therefore, the soil composition appeared old when it was still new. God had created it with the appearance of age.

This is true for the entire universe. Everything was created fully mature and placed in an environment which was completely ready for it.

Critics are quick to point out that appearance of age implies a deceptive God. Why would a God of truth cause things to look as though they were old when they were really young? Why would this God make evolution appear to be a viable, working process when life on Earth is actually quite young? This is deceptive and therefore impossible. A God of truth would not lie.

Creationists respond that if God created even the most minute objects, "like atoms," they would still have an appearance of some age:

> It would still be possible to interpret the newly-created matter in terms of some kind of previous evolutionary history. And if God could create atomic stuff with an appearance of age...then there is no reason why He could not, in full conformity with His character of truth, create a whole universe full-grown. (Whitcomb and Morris 1971: 238)

After all, what better way is there to test human faith? Many critics throw up their hands and admit to the untestability of the appearance of age hypothesis.

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Appearance of age sounds absurd, but how can anyone refute it? (Ecker 1990: 26).

Perhaps the refutation is to be found in a slightly different approach to the problem. To ponder whether God deceived us by creating something younger than it appears enters the realm of "determining God's will." How can that be tested? What if, however, we perceive objects which God created (according to the creationists), but which are not really there? What if these objects never existed at all? Testing appearance of age as an hypothesis removes God as a concern. We are then able to judge the reality of that which we observe.

The appearance of age argument is applied to the entire universe. Creation was a complete creation. The universe was created as a functioning entity. All photons were created at the same instant as were the stars from which they apparently derived. Any hypothetical observer at the moment of creation, therefore, would theoretically be able to see the most distant objects. Although a galaxy may be millions of light years distant, its light had already been spread throughout the universe. It therefore could have been created 10,000 years ago and be visible to us then and now.

It is possible to test appearance of age relative to the universe and its distribution of photons. Imagine a star some 15,000 light years distant from us. One evening we notice that it has exploded as a brilliant supernova. According to scientific models we may reasonably guess that the star exploded 15,000 years ago.

According to creationists, however, that star could only have been created 10,000 years ago. The image we see as a supernova has thus been traveling through space toward us for 10,000 years at the most. Since the star is 15,000 light years away, the image of the supernova must have been created, in space, 10,000 light years from the earth. If, at the time of Creation, we were to travel from that created supernova image back to its intended point of origin we would discover that which was actually created; i.e., a supernova remnant. From Earth to the supernova image, however, light would be distributed in the image of a star. Since the supernova was the object created, the star which was visible for nearly 10,000 years has never existed.

It is therefore possible to derive the following premise concerning any star which is observed as a supernova: If this star's distance in light years from the observer is equal to or greater than the time since Creation, then the star has never existed as a star.

Following the creationist model we are then required to conclude that Supernova 1987A, located in the Large Magellanic Cloud some 170,000 light years distant, never existed as a "normal" star. "Appearance of age" therefore fails to adequately explain that which we observe.

Appearance of age also leads to some rather fascinating conclusions about our Sun and Earth. Given the expected life span of the Sun, the time expended

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since Creation is negligible. It would be safe to say that the sun will continue to exist in its present form for another 5 billion years of so.

We imagine another observer, located 10 billion light years distant. We may also assume, in keeping with the appearance of age, that the light from the Sun has also been infinitely distributed at Creation. When the Sun dies the light from its nova will pass the observer after a total of 15 billion years since creation. This is clearly impossible, however, as the Sun would only have existed for 5 billion years.

In order to adjust this balance between distance and time observed, the nova's location at Creation must be adjusted. If the nova were created in space at the same location and time the Sun was created, then an observer 10 billion light years distant will see a star for 10 billion years. This also is impossible because the Sun would never have existed and the apparent age of the Sun would be 10 billion years, not 5.

If, however, the nova image were created 5 billion light years out from the Sun then the observer would see the Sun for 5 billion years. The nova would also appear to be 5 billion years old and 10 billion light years away. Once again though, the Sun will never have existed. Neither, one must add, would the Earth nor all life on it. If appearance of age is valid, we would not exist.

Dealing with creationists can indeed be frustrating. In their orthodox traditions, the major Western religions assign God the primary role in Creation. As human knowledge about the evolution of our universe increases, the further God is distanced from involvement in that evolution. It would appear as well, that the further God is removed from this active role the greater the energies expended by creationists to rationalize the ever-narrowing corner in which they place themselves. Who knows, perhaps if this process continues, we will eventually reach some well-contemplated conclusion that, no matter where in the universe the observer is located, nothing observed in the universe has ever existed. Time will tell.

Notes

1. Related by Professor Stanley Gevirtz in a personal communication dated October 15, 1974. This notion is also mentioned in Coote and Ord (1991: 51–53), although they give no reference in support. Other good technical sources for Biblical Criticism are to be found in Speiser and Westermann. Kittel is perhaps the best source for the Hebrew text. See also Cassuto (1961:16–17); Driver (1954: 2); Sarna (1989: 3–4).

2. Even within the rationale of creationism this is hard to support. As mentioned, actual sunlight was not present until Day 4. In addition, according to Whitcomb and Morris (1971: 241), the Bible indicates that it did not rain on the earth until the Flood of Noah.

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Lessons from Piltdown

John H. Langdon

Piltdown Man, "*Eoanthropus dawsoni*," is one of the most widely publicized hoaxes of modern science. The ready acceptance of the fossils into established science in 1912 and subsequent years became an acute embarrassment to individuals who were directly involved; and the affair is often reported as a shameful episode in paleoanthropology—e.g., "most contemporary anthropologists want to forget that 'Piltdown man' ever happened" (Boaz, 1981: 400). Creationists, in particular, have seized upon the Piltdown hoax and the discomfort of anthropologists to ridicule evolutionary science and frequently to imply that many, if not most, key fossils are likewise forgeries. "The success of the Piltdown hoax for nearly fifty years in spite of the scrutiny of the world's greatest authorities, along with other stories nearly as dubious, led Lord Zuckerman to declare that it is doubtful if there is any science at all in the search for man's fossil ancestors" (Gish, 1978: 121).

Certainly it is an embarrassment to all that one or more unidentified members of the scientific community were responsible for fabrication of data and for deceiving their colleagues. The crime was compounded not only by the failure of the person or persons responsible to reveal the hoax but by their continuation of the hoax in a series of subsequent "discoveries." Present day attention focuses primarily on the still arguable question of who was responsible. As Weiner noted in 1973, the real significance of Piltdown has been generally misunderstood. The episode served to expose the excessive subjectivity in paleoanthropology of the period and became an important spur in the development of rigorous and quantitative approaches in paleoanthropology. It is the contention of this paper that Piltdown should also be viewed as an important success for science and the scientific method. It has represented a unique type of test for the validity of hominid paleontology and of evolutionary reconstruction in general. It can be a useful teaching tool to illustrate how science is performed and how science differs from other types of critical inquiry.

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The narrative of the Piltdown discovery, its impact, and its ultimate debunking has been related many times, most recently and authoritatively by Spencer (1990a). In February, 1912, the amateur geologist Charles Dawson wrote to Arthur Smith Woodward at the British Museum to inform him of the discovery of fragments of a robust human skull. Further excavations that year yielded more bones, including part of a decidedly ape-like mandible. Fossils and flint tools accompanying the skull suggested an apparent geological age of late Pliocene to early Pleistocene (early to middle Pleistocene by modern calibration). Woodward, with the assistance of Grafton Elliott Smith and Woodward's colleagues at the museum, reconstructed the cranium to have a brain size near the lower end of the human range, but otherwise to be quite modern in morphology. The mandible was attached to a primitively prognathic face and given the name "*Eoanthropus dawsoni*." This model, unveiled in December, 1912, initiated four decades of debates concerning the validity of the reconstruction and the proper dating.

Over the next few years, additional discoveries included an unusual ape-like canine, an elephant bone "cricket bat," and other fossils and artifacts. All materials were subjected to close critical examination. General opinion held that the cranium did not appreciably differ from that of modern *Homo sapiens*, and that the mandible appeared incompatible. Miller (1915) made the strongest case that the two could not have belonged to the same species, and swayed the opinions of many non-British anthropologists. The full attack, however, was preempted by the "discovery" of a second specimen from a nearby site, dubbed Piltdown II. Many regarded this as a confirmation of the first specimens.

Subsequent discoveries of fossil hominids around the world and continued scrutiny of the Piltdown material made "*Eoanthropus*" ever more anomalous. By 1953, most anthropologists had found reason to question its significance on the basis of revised stratigraphy and more complete phylogenies. In that year, Weiner, Oakley, and Clark published "The Solution to the Piltdown Problem," in which they uncovered its fraudulent character. In this study and a subsequent one (Weiner, et al., 1955) they revealed that all of the materials had been stained to look fossilized and placed in the Piltdown gravels with the intent to deceive the scientific community. The cranium was indeed recent. The mandible and canine, which were orangutan in origin, had been altered by filing the teeth to create a more human-like wear pattern. Weiner performed the first, and still the most reasonable, inquiry to identify the person or persons responsible (1955). He built a strong case of evidence against Dawson and left open the possibility that someone else may have been involved. Woodward and Smith appear to have been innocent victims.

The initial acceptance of "*Eoanthropus*" by the scientific community raises troubling questions about the conduct and competence of science. The forgeries passed initial critical examination. In spite of several excellent

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critiques, the cranium and mandible were still considered by many to belong to the same individual. Only after many years were the specimens finally rejected.

Support for the initial interpretation of "*Eoanthropus*" was not as deep as common wisdom suggests. According to Gish, "Although a few experts, such as Boule and Henry Fairfield Osborn, objected to the association of this very ape-like jaw with a very human-like skull, the consensus of the world's greatest authorities was that Piltdown Man was indeed an authentic link in the evolution of man" (1985: 188). On the contrary, extensive reading of the literature shows that there never was consensus on the interpretation. However, many scholars and writers of prehistory did not have the expertise, opportunity, or inclination to conduct their own analyses and tended to repeat the conclusions of those who did. Commonly they relied on the more easily communicated conclusions of the British anthropologists rather than on scattered criticism. Secondary and popularly written literature therefore gives a misleading impression that "*Eoanthropus*" was universally accepted.

What can this episode teach us about the process of paleoanthropology and of science in general? A retrospective study of the Piltdown affair is a valuable mirror in which we can recognize both problems and strengths in the conduct of science.

LESSON 1. The Initial Acceptance of the Forgery Reflected Legitimate, Though Flawed, Scientific Process

A major contribution to the success of the fraud was the particular academic circle in which it appeared. Woodward, a vertebrate paleontologist, may not have had extensive experience with fossil hominids. The anatomists Smith and Keith had no such defense. However, the discovery coincidentally fit neatly into their previously conceived theories of human evolution (Langdon, 1991), and they were quite vulnerable to self-deception in their interpretation of the evidence. All, of course, were conscious of the reputation that a major new hominid skull would confer. These subjective considerations only explain part of the failure of science to recognize the Piltdown cranium for what it was.

The most persuasive argument for placing the fragments into a single skull was simply that the specimens were found together. This premise, assumed from the beginning, strengthened with subsequent finds. For example, "The remarkable new canine tooth is certainly that of a Primate Mammal, and may therefore be referred without hesitation to Eoanthropus" (Dawson and Woodward, 1914:87). The argument of association by proximity was weak and vulnerable to ridicule by other paleontologists (Matthew, 1916; Weidenreich,

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1943); but it proved as convincing to many contemporary anthropologists as it did to the original describers.

Intrinsic features, some of them contrived by the forger, appeared to link the cranium and mandible. The forger selected bones that were of a compatible size and stained them to show similar wear and coloration. The mandible itself appeared odd and had several human traits. The artificial abrasion on the molars appeared more human than otherwise, and some specific dental measurements matched those of human teeth. Furthermore, an early set of X-rays of the molars was erroneously interpreted to demonstrate shorter, more human roots (Clark, 1955). Such observations supported the initial conclusion that the mandible was not that of an anthropoid ape and did indeed belong to the cranium.

The obvious alternative interpretation, the presence of an anthropoid ape in England, raised it own difficulties. Those who challenged the reconstruction uniting the cranium and mandible before 1953 needed to explain the presence of an ape in England in the Pleistocene. There is no record of such specimens from anywhere in Europe later than the Miocene. This counterargument continued to give support to those who retained the jaw with the cranium.

Piltdown II appeared to confirm the original discovery. Many who questioned the find initially, or might have done so, were convinced by the second specimen (e.g., Gregory, 1922; Lankester, 1917; MacCurdy, 1924; Osborn, 1921). The later discovery tipped the balance of argument away from those who were skeptical on anatomical grounds toward those who were more perplexed by the presence of an unusual ape in Pleistocene England.

The existence of Pliocene or Pleistocene remains of anatomically modern humans received qualified support from a number of controversial discoveries. Keith summarized these in his books (1915, 1931) and reinforced his case for Pleistocene humans on them. They include one mandible widely accepted as a fraud (Moulin Quignon) and other finds that were largely rejected by Keith's contemporaries as being recent or of indeterminant age: Denise, Olmo, Foxhall, Clichy, Castendolo, Grenelle, Talgai, Galley Hill, Dartford, Olduvai, London, Gambel's Cave, and Kanam. Two later discoveries of genuine antiquity, Swanscombe (1936) and Steinheim (1933), added enough ambiguity to the record of morphological evolution to further obscure the issue.

Practical considerations, but not secretiveness, limited critical first-hand review by other researchers. It is essential in science that critical research and observations be repeated for validation; but practical considerations make it impossible for everyone in the field to verify them personally. Several researchers attempted their own reconstructions of the skull, including Keith, Osborn, Rutot, and Smith. A number of anthropologists observed the specimens at first hand in London and casts were widely distributed for anatomical

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comparisons. Oakley (1979) and Spencer (1990a,b) have argued that, contrary to previous allegations, Woodward did not jealously secret the original specimens from his colleagues. However, time and expense of travel, and constraints during the war years impeded free observation by foreign scholars.

Comparative anatomical studies fell far short of the modern standards. Many of the successful arguments in favor of associating cranium and mandible were based on matching selected features of the fossils against single museum specimens, while individuals pointing out specific discrepancies tended to be quickly dismissed (e.g., Lyne, 1916; Underwood, 1914). This practice is criticized in hindsight for its failure to use a statistical or population approach or for the failure to consider the overall form of the specimens. Even the excellent and systematic contemporary studies of Miller (1915, 1918) were not widely appreciated as being qualitatively superior to his opponents.

LESSON 2. The Acceptance of Piltdown Was Made Necessary by the Process of Science and Its Inability to Reject Data

By the nature of the scientific process, an acceptable theory must take into account all the relevant evidence. When data clearly contradict the hypothesis, the hypothesis must change. The only alternative is to reinterpret the data on the basis of errors or of new perspectives or to place the data in abeyance until further advances resolve the contradiction. This principle is the foundation of scientific methodology, and differentiates it from the advocacy used by many creationists and by many non-science disciplines.

"*Eoanthropus*" represented evidence at odds with other data. The discovery was in conflict with the pattern of human evolution revealed by other fossils. The dentition yielded inconsistencies of age, wear, and articulation with the cranium. The apparent dating was found to be problematical. The accumulation of these contradictions continued with each decade. The frustrations were expressed well by MacCurdy as he conceded reluctant acceptance of the mandible:

> The prehistoric archaeologist sometimes uncovers strange bedfellows; no other discovery is quite so remarkable in this respect as the assemblage from Piltdown. Nature has set many a trap for the scientist, but here at Piltdown she outdid herself in the concatenation of pitfalls left behind—parts of a human skull; half of an apelike lower jaw, a canine tooth, also apelike; flints of a Pre-Chellean type; fossil animal remains, some referable to the Pliocene, others evidently Pleistocene; all were

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> at least as old as the gravel bed, and some of the elements apparently were derived from a still older deposit. . . . (1924: 333).

There was no easy explanation for the Piltdown site that did not raise other problematic issues.

Until the specimens could be dismissed as fraudulent, they could not be ignored. As outlined below, there was extensive and imaginative effort to find an interpretation of the site that reconciled it with the emerging picture of human evolution. In the absence of an inclusive paradigm, many placed it into a suspense account as unresolved. It was only when Weiner and Oakley examined the specimens with the hypothesis of fraud in mind that Piltdown could be dismissed as essential fossil evidence.

LESSON 3. The Self-Correcting Process of Science Worked As It Should Have

Science should be self-examining and self-correcting, since theories are critically retested to the point that errors will be revealed. "*Eoanthropus*" was put to rest with the proof of forgery in 1953; but for most researchers in the field, it had already been rejected, in the sense that it no longer shaped theories of human evolution. The Piltdown affair shows that the self-correcting process is reliable, but that it may take a long time.

Formal critique began with the first description of "*Eoanthropus*," as recorded in discussions at the meetings of the Geological Society (Dawson and Woodward, 1913, 1914, 1915; Woodward, 1917). The important questions that were to be asked repeatedly over the next four decades were immediately raised: Was the reconstruction valid? Was the dating valid? Did the skull and jaw belong together?

The correct answers to these questions were acquired by continued scientific study and came before 1953. No single criticism of the Piltdown specimens swayed the scientific community. Rather, the gradual erosion of the theoretical framework in which "*Eoanthropus*" fit led to a steady increase in skepticism between 1930 and 1950 and a decrease in the ranks of its advocates.

The Question of the Reconstruction

Woodward unveiled the first reconstruction with the public announcement of the discovery. Keith had begun his own version even before this date. As described by Spencer (1990a), Keith and Smith, while agreeing on the basic premises posed by Piltdown, subsequently carried out a prolonged and bitter dispute over the details of reconstructing the skull, especially concerning its brain size. Smith continued to receive criticism for his interpretation

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of primitive endocranial features. In later studies, there was little disagreement that the cranium was essentially modern in morphology and the issue shifted to whether or not to accept the mandible as part of the same skull.

Researchers converged on an anatomically correct interpretation and incidentally helped to advance the science of skeletal reconstruction. Nonetheless, the presence of a modern cranium in an ancient setting was a significant fact. With or without the mandible, it supported the hypothesis of multiple hominid lineages. Only as its apparent antiquity faded could it be dismissed.

The Question of Dating

The Piltdown hominid material was accompanied by an array of familiar non-primate fossils. Some of these were believed to represent the late Pliocene; the rest were early Pleistocene. To whichever assemblage the skull and jaw should be assigned, the implied date was old—older than the known Neandertals of continental Europe or of *Pithecanthropus* from Java. The total collection appeared to preclude the possibility that "*Eoanthropus*" was a recent intrusive burial. In subsequent discussion, the older (Pliocene) date was preferred by advocates of the eolithic" culture, while a more conservative Pleistocene date was supported by others.

Only later was the geological position of the Piltdown gravel challenged. Newer surveys of the region in 1925 revealed the deposits belonged to a gravel terrace that was Upper Pleistocene and inconsistent with the apparent faunal age. Subsequently many authors chose to dismiss the skull as recent (Braidwood, 1950; Hill, 1954; Marston, 1936, 1950).

[Since 1948, the Plio-Pleistocene boundary has been recalibrated to include these strata and their fauna in the Pleistocene. Contemporary terminology is used throughout this paper.]

The Question of the Association of the Mandible and Cranium

The joining of the cranium and mandible was the most controversial aspect of "*Eoanthropus*." Most researchers recognized the incongruity of pairing a modern-looking human braincase with a very ape-like jaw and attempted to resolve this problem in a variety of ways:

Making the cranium or the individual more primitive to correspond to the jaw. Smith emphasized primitive aspects of the brain development (e.g., 1913a, 1916, 1917), while Woodward's reconstruction yielded a brain size in the lowest end of the human range. This attempt to make the cranium out to be more primitive than it, in fact, was, formed the substance of the disagreements between Smith and Keith. Lankester (1915) and

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Thacker (1916) also inferred a more primitive status for "*Eoanthropus*" simply to make it more consistent with the geological context. This view was opposed by Keith's more accurate reconstruction of a fully modern cranium.

Making the mandible more human to correspond to the cranium. Keith's initial critique of the Woodward reconstruction argued for shorter jaws and more human-like dentition (1913). He discarded this hypothesis when the canine was found. Several other authors also emphasized human aspects of the jaw in an attempt to reduce the discrepancy (Dixon, 1917; Kleinschmidt [in Miller, 1929]; Puccioni, 1913; Pycraft, 1917).

Emphasizing racial diversity within a single hominid species. Especially as revisions of the dating suggested a younger age for Piltdown, several observers argued that "*Eoanthropus*" represented a marginal race which had differentiated from the mainstream of the human species (Gregory and Hellman, 1926; Keith, 1948; Mayr, 1950; Oakley and Muir-Wood, 1949; Oakley, 1950). This approach did not resolve the anatomical inconsistencies, but did eliminate the need to fit the skull into the phylogeny of human ancestry.

Disassociating the specimens. The articulation of the mandible and cranium was criticized repeatedly, especially by American and German anthropologists, who assigned the bones to different genera (Boule, 1923; Braidwood, 1950; Eastman, et al., 1916; Friederich, 1932; Gregory, 1916; Hrdlicka, 1922, 1930; Lull, 1927; MacCurdy, 1916; Miller, 1915, 1918, 1929; Mollison, 1921; Ramstrom, 1921; Schwalbe, 1914; Sicher, 1937; Weidenreich, 1937, 1940, 1943; Weinert, 1933; Werth, 1916). In Britain, there were a few initial skeptics (Lyne, 1916; Waterston, 1913a,b; Wright, 1916), but a systematic attack was mounted only by the next generation of anthropologists (Leakey, 1953; Marston, 1937, 1952; Montagu, 1951a; Zeuner, 1946).

Most other later writers acknowledged this criticism and the strength of its arguments, but felt the problem of explaining a Pleistocene ape in England left it unresolved.

Sidestepping the specimen as problematic and unresolvable. As new discoveries of fossil hominids appeared and the theoretical and geological support for "*Eoanthropus*" diminished, it became increasingly more comfortable to regard the Piltdown find as an unexplained enigma (Birdsell, 1950; Clark, 1949; Stewart, 1950). By the 1940's very few anthropologists accepted Piltdown at face value, Broom, Hill, Hooton, and Keith being among the few exceptions. Writers of secondary literature continued to mention the fossil for the sake of completeness, but were non-committal as to its nature. Montagu, for example, discussed the specimen inconclusively in his textbook (1951b) in the same year he strongly attacked it in a technical journal (1951a).

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The Position of "*Eoanthropus*" in Human Phylogeny

The initial presentation by Dawson and Woodward portrayed the Piltdown individual to be a large-brained ancestor of modern humans. The primitive jaw indicated its transitional status and revealed the sequence of evolutionary change. Keith championed that view in his subsequent writings, seeing it as a confirmation of his earlier theories. The specimen implied that the human lineage was established before the appearance of Neandertals. Consequently, consistent with several contemporary opinions, the Neandertals could not have contributed to modern populations.

This interpretation faced increasing conflict from new fossil discoveries. *Australopithecus* (1924, 1936, and later), Peking Man (1921-1937), and Broken Hill (1921) continued to reinforce the evidence that the cranium evolved more slowly than other parts of the anatomy. The evidence for robust smaller-brained fossils became more widespread and more consistent than that for a more advanced lineage. The "pithecanthropine" lineage, including Neandertals, gained importance in phylogenies, and the position of "*Eoanthropus*" became ever more peripheral and problematic. The discoveries at Mount Carmel between 1929 and 1934 documented an apparent transition between the Neandertal and modern skull morphology which convinced even Keith (1948) that the large brain of Piltdown was a precocious side-show, at best.

Without a phylogenetic framework in which to place "*Eoanthropus*," resistance to a relatively recent date crumbled. The morphological mosaic now presented only minor puzzles to be explained away. The final revelation of fraud provided that explanation.

LESSON 4. The Adoption of New Technologies, by Itself, Does Not Advance Science

Although the exposure of the fraud is commonly associated with the introduction of more sophisticated technology—fluorine dating—potential contributions of the physical sciences had been long available and did not by themselves dispel the hoax. Even before the public presentation of "*Eoanthropus*," a piece of the cranium had been examined for its organic content and showed a high degree of mineralization (Dawson and Woodward, 1913). Had the same test been performed on the mandible, the fraud might well have been revealed at that time.

The principles of fluorine dating had been known since the last century, but the techniques were considered imprecise and were not commonly applied to fossils. Oakley can be credited with reviving its application in paleontology. In 1948 he successfully demonstrated that the Galley Hill

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skeleton was a recent burial. His first attempt to apply fluorine dating to Piltdown actually appeared to confirm the association of jaw and cranium (Oakley and Hoskins, 1950). The second study, with improved sensitivity, was applied after Weiner had pressed a case for forgery and superficial examination of the specimens supported his suspicions. This test conclusively revealed a discrepancy in fluorine content among the bones (Weiner, et al., 1953), which was confirmed by additional chemical analyses and radiocarbon dating.

The episode played a significant role in the introduction of such technology to paleoanthropology in the same way that it encouraged more rigorous application of other approaches. However, the exposure of the forgery cannot be argued to be the consequence of newly available technology. It resulted from the anomalous position of "*Eoanthropus*" in the unfolding story of human evolution that required a specific hypothesis of fraud to resolve. As in any field, the questions that give direction to research are of much greater significance than the technology that may become available.

LESSON 5. Although Individual Researchers Can Be Misled by Subjective Interpretations, Science Remains Objective Because It Tends to Reflect a Consensus of the Scientific Community

Several authors have pointed out the susceptibility shown by the proponents of Piltdown to being misled by their theoretical biases (Gould, 1979; Hammond, 1979; Nuttall, 1917; Vere, 1959). Collectively, the Piltdown specimens appeared to support several hypotheses that had been proposed and debated within the scientific community at the time of discovery. This may well have been the single most important factor in their rapid acceptance.

The pattern and sequence of anatomical evolution. The association of a human braincase with the jaw of an ape is the most vivid image of the hoax and one that corresponded to contemporary theories. "So far from being an impossible combination of characters, this association of human brain and simian features is precisely what I anticipated" (Smith, 1913b: 131).

"*Eoanthropus*" was an almost literal materialization of the hypothesis of several anthropologists that the advanced brain and implied cultural capacity was the leading and driving force behind human development (Boule, 1923; Keith, 1912; Smith, 1913a). The inference was that the brain would have become human-like sooner than other parts of the anatomy. This prediction was in conflict with the anatomy of *Pithecanthropus*, discovered in Java in 1891, which represented a fully bipedal creature with a primitive brain.

The Piltdown skull matched the ideas of Smith especially well, and his interpretations stressed the primitiveness of the large-brained specimen. For

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Keith and Boule, the ape-like nature of the mandible was too primitive for so advanced a brain. Boule maintained a more detached skepticism.

Keith criticized Woodward's reconstruction:

> Professor A. Keith regarded the discovery of fossil human remains just announced as by far the most important ever made in England, and of equal, if not greater, consequence than any other discovery yet made, either at home or abroad. He agreed that the reconstruction of the skull had been executed with great skill, the only point in the restoration about which he was not convinced being the chin-region of the mandible and the form of the incisor, canine, and premolar teeth. The restoration approached too nearly the characters of the chimpanzee (Dawson and Woodward, 1913: 148).

Eventually Keith, influenced by new discoveries, overcame his doubts and took a firm stand, placing Piltdown as a Pliocene offshoot from a major human stock (1915). The advanced cranium of "*Eoanthropus*" was evidence that the later Neandertals were not ancestral to modern man, while the primitive mandible similarly excluded "*Eoanthropus.*"

Multiple European lineages in hominid evolution. The faunal dating, together with the advanced morphology of the skull, suggested that the true human lineage had far older roots and bypassed most of the known fossils. Again the discovery of an advanced cranium appeared to support such theories as those of Keith and Boule that a pre-sapiens species antedated the classic Neandertals. At the same time, it contradicted the competing hypothesis that there was never more than a single lineage of hominids.

The existence of an eolithic culture. In the mid-nineteenth century, fractured flints widely collected in Britain were argued to represent a most primitive pre-Chellean tool culture of Pliocene humans termed eolithic." Opponents claimed they were naturally fractured and unrelated to human activity. The Piltdown finds included examples of both eolithic and familiar Paleolithic tools. The apparent association of these most primitive tools with a human of great antiquity was consistent with views held by other individuals and lent support to the validity of the Piltdown fossils. Conversely, it gave additional credence to the eolithic culture and won enthusiastic supporters.

These several hypotheses, now rejected, prepared the way for the Piltdown fraud especially in England and shaped subsequent interpretation of the data. It is ironic that the hoaxer probably was not attempting to fit his creation into any particular framework. The form of "*Eoanthropus*" was determined largely by the limited materials available (Langdon, 1991).

The seduction of preconceptions will always be a genuine problem in science. Paleoanthropologists, dealing with the sensitive issues of human nature and identity, may be especially prone to this error. The condemnation of science

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for losing its objectivity may be mitigated by the observation that, had Piltdown been validated, some of its critics may have been accused of subjective bias in rejecting the specimens in favor of their own theories. Subjective interpretation is not easily distinguished from objective truth when it is, in fact, correct.

In the face of these shortcomings, the Piltdown episode has shown that a consensus did form around an objectively correct idea (i.e. the removal of "*Eoanthropus*" from hominid phylogeny). This occurred in spite of the fact that a debate continued over conflicting models of human evolution to which the fossil was relevant (e.g. single species hypothesis, pre-sapiens hypothesis). It is notable that collection and interpretation of data and the formulation of hypotheses are acts of individual researchers. The efforts of Smith and Keith placed "*Eoanthropus*" before the scientific community, and the investigations of Weiner, Oakley, and Clark were needed to formally reject it. However, the position and progress of scientific knowledge is charted through the consensus of the larger body of scientists. It is their collective opinion that informs us when an hypothesis has been accepted or when a revolution has occurred.

While we may be less certain about objective truths in other areas, the verdict given to the Piltdown specimens may be read with some assurance that, in the long run, individual subjective opinions and anomalous observations will not interfere with progress in the field.

LESSON 6. Piltdown Was an Important Validation of the Practice of Evolutionary Science

Gish has written "The success of this monumental hoax served to demonstrate that scientists, just like everyone else are very prone to find what they are looking for, whether it is there or not" (1978: 121). He quotes Hawkes in a similar vein: "Accepting this as inevitable and not necessarily damaging, it still comes as a shock to discover how often preconceived ideas have affected the investigation of human origins. There is, of course, nothing like a fake for exposing such weaknesses among the experts" (Gish, 1985: 189). Have forgeries such as Piltdown discredited scientific objectivity or have they merely proven it by being uncovered? Allowing for individual error, evolutionary science has been strengthened and validated in its methods, if not its reputation, by the Piltdown episode.

The theory of evolution as accepted by biology includes the descent of all living and extinct species from a common ancestor and requires that all species be connected with one another by sequences of transitional forms which may or may not be known from the fragmentary fossil record. However, when apparent discontinuities between taxa are so readily dismissed, opponents criticize evolution on grounds of non-falsifiability. Furthermore, the ease with which researchers alter phylogenetic hypotheses in the face of new evidence suggests that there may be no rigor to building those

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hypotheses. It is obvious to biologists that this flexibility is necessary from the nature of the task. Does it also disguise the fact that no evidence or lack of evidence can be conceived that might contradict the theory of evolution?

A natural example of this is the Cambrian fauna of the Burgess shale recently publicized by Gould (1989). This collection from the dawn of complex animals includes many fossils which do not have clear affiliations with known taxa, but there is expectation that even these can eventually be assigned places in natural phylogenies (e.g. Briggs, et al., 1992; Levinton, 1992).

The validity of the methods of paleobiology might be better tested by their ability to recognize a true discontinuity, where a species has no relationship with earthly forms. But such a test case is, according to evolutionary theory, impossible unless an extraterrestrial fossil is introduced or an artificial one created. The synthetic "*Eoanthropus*" qualifies as a test. The fact that the Piltdown forgery was composed from bones of real species, intended to fit into a real lineage, and placed in a plausible geological context made it that much more effective as a test. Piltdown was indeed recognized as unnatural and ejected from the primate lineage, even in the often subjective subfield of paleoanthropology. Thus, both the internal consistency of the fossil record and our ability to detect discrepancies have been confirmed.

Conclusions

Contrary to common attitudes, the Piltdown episode may be promoted and taught as a successful example of the scientific method in action. While it casts a dubious light on the performance of certain representatives of science, it does illustrate very well the theoretical and technological progress that paleoanthropology and evolutionary science have accomplished. It is an extended case study of the scientific process, exemplifying conflict and debate, the ascent and dismissal of major hypothesis and minor ones, the necessity of cumulative observations, the significance of scientific consensus, and the triumph of contradictory data over incorrect theory. In the final analysis, it gives assurance that the scientific method applied to paleoanthropology can recognize objective truth.

Acknowledgments

I am grateful for enlightening discussions and helpful comments of Ms. Terry Langdon, Dr. Gregory Reinhardt, Mrs. Jane Langdon, Dr. John Batey, and anonymous reviewers in the preparation of this paper.

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Creationism in North Carolina: A Recent History

Christopher P. Toumey

In the 1980s, scientific creationism enjoyed a very large base of potential sympathizers in North Carolina, yet its advocates could never convert that into political support to force public schools to adopt "equal time" policies.

In 1983 the Carolina Poll found that 53.4% of the adults it surveyed in North Carolina agreed with the creationist position, that "God created man pretty much in his present form at one time during the last 10,000 years." (The Gallup Poll registered 44% support nationally for the same statement.) The variables most strongly associated with creationism and evolution were religion and education. Church attendance and being a Baptist were the strongest predictors of support for creationism; lower levels of education indicated support for creationism, and higher levels indicated support for evolution. (Elsewhere [Toumey 1990] I analyze these poll results in much more detail.) It should be noted that Southern Baptists accounted for 42.3% of all religious adherents in North Carolina, or 22.8% of the state's total population (Quinn 1982). This did not include Independent Baptists, Free Will Baptists, Primitive Baptists, Black Baptists or Northern Baptists, let alone nonBaptist conservative Christians.

North Carolina's newspapers devoted considerable coverage to such national events as the Arkansas trial of 1981, but they offered scant reports of local anti-evolutionist activities. The *Charlotte Observer* documented creationist policies in the public schools of Lancaster, South Carolina, but cited no such cases for North Carolina. It could only report the warning of a fundamentalist leader, Rev. Dan Carr, that creationist legislation "is likely within the near future," even as Rev. Carr admitted that opposition to abortion and the Equal Rights Amendment were more important priorities (*Charlotte Observer*, 21 September 1980). Two years later, after the Arkansas law had

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received considerable national attention, there was still next to nothing that was deemed newsworthy in North Carolina. The *Greensboro Daily News and Record* quoted Rev. Lamarr Mooneyham, chairman of North Carolina Moral Majority, who complained that evolution had entered the public school curriculum without a referendum, but in the same article Mr. Paul H. Taylor, Director of Science Education for the Department of Public Instruction, said that his office had no official policy on the teaching of creationism, since "there is no overwhelming pressure we can detect in the state to force the issue" (*Greensboro Daily News & Record*, 16 May 1982).

The nation's leading creationist organization, the Institute for Creation Research, mentioned North Carolina very rarely in its chronologies of the travels of Henry Morris and Duane Gish. Between 1974 and 1984, it cited only five visits to North Carolina: a debate between Henry Morris and William Pollitzer in Chapel Hill in September 1974; a seminar conducted by Morris in Raleigh in March 1980; a visit by Morris to Reidsville, Greensboro, and Winston-Salem in October 1983; a speech by Duane Gish in High Point in March 1984; and, a visit by Morris to Winston-Salem in September 1984 (Morris and Gish 1976:5; Morris and Rohrer 1983:226; *Acts & Facts* [published monthly by the Institute for Creation Research], December 1983; June 1984; November 1984). To these can be added a May 1984 appearance in the Research Triangle area by Dr. A.E. Wilder-Smith, who is a European spokesman for creationism, plus a brief visit by Rev. Jerry Falwell in May 1981 at the N.C. Museum of Life and Science, in Durham.

Rev. Falwell came to Durham to film the exhibits on evolution at the N.C. Museum of Life and Science, with the intention of using these as backdrops for a later broadcast of his television program, *The Old Time Gospel Hour*. The museum permitted Rev. Falwell to film its exhibits, but its director, Mr. William M. Sudduth, pointed out publicly that he disagreed with Falwell (*Durham Sun*, 5 May 1981). Sudduth said that the museum frequently received flyers protesting its evolutionary "family tree" display to accompany the museum's evolutionary exhibits (Sudduth, Pers. Comm., 1981). None of the exhibits were ever altered to include creationist information.

When Dr. Henry M. Morris came to the state in October 1983, much of his visit was spent at Community Baptist Church in Reidsville, where he preached on "Evolution in Turmoil" at a Friday night service, then conducted four one-hour sessions on creationism on Saturday. (The pastor at Community Baptist, Rev. Jim Dotson, had helped Morris form a fundamentalist Baptist church twenty years earlier in Blacksburg, Virginia.) At the next day's sessions, Morris chose *II Peter 3* as his Biblical text for the day, using its verses to introduce creationist information, and using his creationist findings to illuminate his Biblical exegesis. At the question-and-answer session, Dr. Morris answered technical questions by referring to Bible stories,a nd to questions on Scripture by presenting technical information. Morris's message was that one

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can be perfectly comfortable with Bible stories, taken literally,and with scientific data, because the two together constitute one truth. In effect, Morris was fine-tuning the sentiments of the local creationists; there is no reason to believe that his visit converted any evolutionists to creationism.

In 1979, Dr. Morris had engendered a creationist study group in the Raleigh-Durham-Chapel Hill area. Members included a science professor who had known Morris while studying at Virginia Tech when Morris was an engineering professor there, and an electronics engineer who met Morris in San Diego in 1978, then returned to North Carolina with an urge to spread Morris's message. With other engineers and scientists, plus some physicians and some nonprofessionals, they formed the Triangle Association for Scientific Creationism (T.A.S.C.) in 1979. Their first notable public activity was a March 1980 weekend seminar featuring Henry Morris in Raleigh. Members of T.A.S.C. subsequently served as speakers for local debates, lectures,and sermons throughout the 1980s. In its early years, T.A.S.C. devoted much of its effort to projecting the message of creationism into the secular culture, but by the mid-1980s, after the national creationist movement suffered great setbacks in its legal strategy and its public image, this group turned its attention more to consolidating support among its natural sectarian constituency. For most summers since 1985, it has organized one-week "summer institutes" at Piedmont Bible College in Winston-Salem.

The principal business of T.A.S.C. has been to meet about ten times a year for small, informal study sessions. The content of these meetings is technical, focusing on scientific information supplied by the Institute for Creation Research, while their format is that of a Bible-study group, beginning and ending with an evangelical prayer, and generally tempered with pious respect for the religious implications of creationism.

During this time, there was occasional mention of creationist sentiments and creationist activities around North Carolina. Students for Origins Research reported a creation-evolution debate at Mount Olive College in Wayne County and a seminar on creationism at Southeastern Baptist Theological Seminary in Wake Forest (*Origins Research*, Spring 1980). When T.A.S.C. brought Henry Morris to Raleigh in March 1980, two local papers report the event (*News & Observer* [Raleigh, N.C.], 22 March 1980; *Triangle Leader* [Research Triangle Park, N.C.], 17 April 1980).

Public School Controversies

The first public instance of modern grassroots creationist agitation in North Carolina was Mrs. Rudene Kennedy's presentation to the state textbook commission, on 8 October 1974. "The response of the committee," according to the Creation-Science Research Center, "was excellent" (Segraves 1977:16). However, there is no indication that the textbook com-

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mission rejected any evolutionary materials, and it certainly did not adopt any creationist texts.

Three years later, an *ad hoc* group called Christians for Academic Freedom approached the Charlotte-Mecklenburg schools (*Charlotte Observer*, 20 April 1977; *cf.* Segraves 1977:17). Speaking for the group, a school teacher, Elizabeth Machen, complained that children were being "indoctrinated" in evolution. A lawyer representing the creationists, James Atkins, argued that "the theory of evolution is on the verge of collapse." The school board never endorsed a creationist policy, but in that year, 1977, it faced a controversy over evolutionary statements in an earth science textbook titled *The World We Live In*. After parents and a preacher voiced complaints at a school board meeting, the board provisionally withdrew the book and sought guidance from the state Board of Education. The state board apparently decided there was a religious conflict in the content of the text, which the Charlotte-Mecklenburg board then discontinued (Vizzini, Pers.Comm., 1983).

A proposal to mandate "equal time for creationism" arose in the North Carolina state senate in 1981. Jack Cavanagh was a freshman Republican from Forsyth County who had been elected in the Reagan landslide of 1980; he was also active in the Christian Action League, a fundamentalist lobbying organization loosely affiliated with the State Baptist Convention. His bill, "An Act to Require Balanced Treatment of Creation-Science and Evolution-Science in the Public Schools," was a carbon copy of Arkansas's 1981 "creation-science" law (NCSS 1981). Among the "findings of fact" it proposed were that "public schools generally censor creation-science and evidence contrary to evolution," and that suppression of creation-science "undermines [students' and parents'] religious convictions and moral or philosophical values, compels their unconscionable professions of belief, and hinders religious training and moral training by parents."

Senator Cavanagh's bill died in committee without attracting a single co-sponsor, either Republican or Democrat. He said he was not aware that his proposal was identical to Arkansas's law, nor had he been in contact with any national organizations, whether Moral Majority, Institute for Creation Research, or Creation-Science Research Center. Said Senator Cavanagh:

> I got additional information for my research from people around here who had heard the idea of [my] bill, and they had written to [ICR] at one time, so they were bringing in some materials to help me. Newspaper articles, magazines, but it wasn't any formal organization at all. You know, it's strange. After you introduce a bill like that, you'd expect that those that are interested in doing some changing, such as the Moral Majority, such as the [creationist] group out in California, would contact you and say, 'we can help, or, 'here's what you'll be up against,' but I got absolutely no call, no letter, from any of those

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> organizations. . . . I am not in contact with the Moral Majority, nor with Pat Robertson, or PTL, or any of those groups, not because I wouldn't be delighted to talk with them, but they haven't gotten in contact with me. I'm not being funded by any of them. I've been accused of that, but it's not true (Cavanagh, Pers. Comm. 1982).

Cavanagh told me that he tried to contact a local expert on creationism, but was never able to reach that person, whose name he had since forgotten. Thus, except for the few informal contacts he mentioned, he received no support at all. After that bill flopped, he tried another approach, i.e., to have the legislature form a "research study commission" to investigate the teaching of evolution in the public schools. That bill also went nowhere. No other creationist bill has arisen since then in the state legislature, and Senator Cavanagh was retired in the 1982 election.

Two scientific organizations reacted against the Cavanagh Bill by adopting resolutions. The North Carolina Science Teachers Association published a position paper in September 1981 (NCSTA 1981). While conceding that evolution should be taught as a theory, "not a fact," and that it should not be presented dogmatically, the statement asserted that "In general, creationism is a religious concept." The North Carolina Academy of Science passed a resolution which was a militant endorsement of evolution, saying that,

> No scientific hypothesis suggested as an alternative to evolution has succeeded in explaining relevant natural phenomena. Moreover, insights provided by evolutionary principles have been the basis for progress in the biological and biomedical sciences which has benefitted mankind in many ways (NCAS 1982).

The state's major newspapers also opposed creationism, and especially its proposals for equal time in science classes. Most vociferous were the *Daily News & Record* of Greensboro (5 March 1981; 13 March 1981; 8 January 1982) and the *News & Observer* of Raleigh (23 November 1981; 24 April 1982; 25 January 1984; 29 March 1984; 23 July 1984; 24 August 1986). Whether these anticreationist proclamations influenced the creation-evolution controversy in North Carolina is hard to say. The state's fundamentalists were most unlikely to heed the advice of the *News & Observer*, the paper they loved to hate, and the resolutions of the two scientific associations were almost as obscure as Senator Cavanagh's proposals.

Moral Majority of North Carolina attacked evolution somewhat obliquely when it published a booklet titled "Textbook Reviews" in April 1981 (MMNC 1981). After scanning numerous textbooks and novels, Moral Majority cited individual passages that were especially colorful or objectionable, devoting most of its attention to teenage sexuality. The review mentioned evolution

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once—in the context of abortion—and it also included a vague complaint about sociobiology. The only other reference to evolution and creationism in the same booklet was a boilerplate list of ten "basic beliefs of humanism," one of which stated that humanism "denies the biblical account of creation."

The North Carolina branch of People for the American Way studied censorship by surveying public school teachers and administrators in 1983 (PfAWNC 1983). PfAW reported that there had been at least 243 recent censorship attempts, and that "the prevailing reasons for attempting to ban these books were objections to profane language, discussion of human sexuality and discussion of atypical lifestyles." The report stated explicitly that "the teaching of evolution was a significant source of censorship activity," but it counted only ten such cases within its total of 243, of which "at least three . . . resulted in limitation of the teaching of evolution, and in one additional case the child of the complaining parent was removed from the class." No doubt there could have been more cases that PfAW discovered, but a total of four incidents in three years is less than catastrophic. PfAW also stated that 13% of the challenges (31 out of 243) addressed an entire subject, as opposed to a single textbook or magazine. Of those 31 cases, "almost all of these challenges were discussions of human reproduction in health classes or other forms of sex education. The remainder were objections to the teaching of evolution." Thus, the PfAW document and the Moral Majority publication imply that, despite the fuss about evolution and creationism in newspaper headlines and the television news, this issue played a minor role in the concerns of the state's fundamentalists.

By the early 1980s, almost all of the state's school districts had adopted procedures for considering complaints about courses, textbooks, or teachers. One such rule was that only a parent of a student in the public school system could make a formal complaint to the school board. preachers could no represent parents, and parents who had withdrawn their children form public schools (e.g., to enroll them in fundamentalist Christian academies) could not instigate challenges. This removed some of the schools' severest critics form the decision-making process. Also, complaints had to be stated in writing, and had to be specific, thereby thwarting the sweeping indictments that are so difficult to respond to otherwise, e.g., the charge that unknown Secular Humanists have captured the public schools. Furthermore, local school officials could isolate a parent's complaint by making an exception for a single student; they could assign an alternative textbook for the daughter or son of an unhappy parent, or, in extreme cases, could excuse the child from the objectionable units of a course (as happened in one case cited by PfAW, above). Even as they did this, the rest of the students continued to learn the subject within the framework of the state's curriculum guide.

When a wave of complaints from fundamentalists hit the public schools in the early 1980s, many teachers and librarians were unaware of the

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appropriate rules and procedures (PfAWNC 1983:5). Within a few years, however, the procedures were well known and used often. Said Dr. A. Craig Phillips, Superintendent of Public Instruction, in November 1983:

> We went through a time when a lot of fundamentalists were looking at school materials. Most school systems did a very strong job of setting up a way in which people with a concern could express it. I feel good about what we've done.... My impression is that there's been a minimal amount of unrest. Censorship efforts, on either side—left and right—have been very limited (*News & Observer*, 7 November 1983).

In 1986, Mary Ann Weathers, former Assistant Superintendent for Curriculum and Instruction in the Moore County schools, sent a survey to each of the state's school superintendents, and received 129 responses (Weathers 1986). She concluded that "every school system has a procedure on file for handling challenges [although, says Weathers, not all personnel knew this].... The procedures proved effective and rarely were materials modified or removed or techniques changed or deleted." In three-fourths of the complaints, said Weathers, "there was no change to the curriculum because of the challenge." Similarly, a 1985 report by the national office of People for the American Way mentioned curriculum complaints by conservative Christians in Buncombe, Carteret, and Mecklenburg counties, but the complaints produced no changes (PfAW 1985).

The topic of evolution was mentioned in passing in an Orange County textbook dispute of 1984, when members of Abundant Life Church, an independent charismatic congregation in Hillsborough, formed a committee called "Concerned Citizens for Better Public Education." According to Rev. David Smith, pastor of Abundant Life, the committee scanned textbooks from the local public schools for "anti-religious" and "anti-moral" content. "The ultimate goal" said Smith, "is to see that texts that are blatantly teaching anti-biblical, anti-moral, anti-religious positions—to have them replaced." The group's most salient objections to evolution were that, in the words of Rev. Smith, "the theory of evolution is being taught as though it was proven with scientific fact," and that "the only reference to creationism was put in the context of a legend, a myth—to us that was very offensive" (Smith, Pers.Comm., 1986).

As a remedy, Rev. Smith suggested to a newspaper that "the biblical account should be given equal weight with evolution in textbooks" (*News & Observer*, 19 October 1984). Mrs. June J. Haas, a conservative member of the school board, echoed Rev. Smith's sentiments: "Who's to say that evolution is a more popular theory? Who can say that? I think creation should have equal time" (*Durham Morning Herald*, 17 October 1984). It seems, however, that the issue of evolution played a modest role in this dispute. If any topic was more prominent that others, it wa abortion. At any rate, this

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dispute dissipated in the fall of 1984 when none of the members of Concerned Citizens for Better Public Education had the standing to initiate a complaint, for none of them were parents of children attending the local public schools. The only change of policy was the introduction of a moment of silence in the classrooms.

One victory for creationists came in March 1984, when school officials in Randolph and Mecklenburg counties decided that a play about evolution for elementary school children was too controversial to stage. "Dandelion," a humorous piece that included fish becoming amphibians and primates becoming bipedal, was often performed in North Carolina schools by an educational acting troupe from Charlotte. It had been booked by ingenuous planners in the Randolph schools, but school officials heard a story on National Public Radio in February 1984 saying it was controversial because of its evolutionary content, whereupon they arranged to replace it with a play about Alaska and Hawaii. Interestingly enough, the fear of controversy arose among the school officials without any direct prodding by creationist parents or conservative preachers. The school superintendent, George R. Fleetwood, explained that his staff canceled the play because "They were alerted to the fact that it had caused concern in other cities" (*News & Observer*, 28 March 1984). Another administrator, Mrs. Loraye H. Hughes, commented that,

> I didn't want to present something that maybe some of the parents would have some hesitation about. Why do that when you can get a play that has no controversial overtones and it is as good in quality? Really, I was looking for a historical play to begin with, not a science play (*News & Observer*, 28 March 1984).

Similarly, Ms. Barbara Koesjan of the Charlotte-Mecklenburg schools decided not to have "Dandelion" shown, explaining that "we serve such a diverse group of people, and I see no reason to raise that flag (evolution) with them. Maybe public people are running a little bit scared on some things" (*Charlotte Observer*, 29 March 1984).

Denouement

By 1985, the creationist challenge to science education in North Carolina's public schools had almost evaporated. This can be seen in the comments of Dr. Ira Trollinger, Assistant Superintendent in the Orange County schools, who had been president of the North Carolina Science Teachers Association in 1983. In 1984 he said that he noticed very little state-wide pressure from creationists. Speaking as an officer of the science teachers' group, he told me that the organization was comfortable with the status of evolution at that time. To the best of his knowledge, he continued,

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there were no conservative Christian groups pressuring the science teachers on the creation-evolution issue (Trollinger, Pers.Comm., 1984).

Another interested party was Dr. Ray Flagg, a vice president of Carolina Biological Supply, a national manufacturer and publisher of materials for science education. Flagg had been president of the North Carolina Academy of Science in 1983–1984, and had helped draft the Academy's 1982 position paper. In July 1985, Flagg said that in the early 1980s, fundamentalist Christian academies had often complained about evolution in the books and films of Carolina Biological Supply, but that these complaints were now rare (Flagg, Pers.Comm. 1985).

A third person, Dr. William Spooner, of the Division of Science in the N.C. Department of Public Instruction, agreed that creationism had peaked. There were many complaints around 1981 and 1982, often involving threats of litigation, he said, but, he added, "I haven't encountered it much in the last couple of years [i.e., 1984 and 1985]." Spooner was confident that students whose teachers followed the state's curriculum guide for science were exposed to evolution, which, he said, was implied throughout the guide. He explained that local school boards beset by creationists could protect themselves by referring complaints to the state Department of Public Instruction, which could be represented by the state Attorney General, since the school boards were following state guidelines when they featured evolution in their science courses (Spooner, Pers.Comm., 1985).

In February 1985 the national office of People for the American Way evaluated 18 high school biology texts for their respective approaches to evolution. Although half were disappointing, three were considered especially bad because they totally avoided the word "evolution," while three others were praised for their forthright presentations of evolutionary ideas. None of the "bad" books had been approved by the North Carolina State Board of Education, but two of the three "good" ones had. Manley W. Midgett, science supervisor for the Wake county schools, was paraphrased to say "that textbooks used in the local schools address evolution and that all of the major books being considered for use next year addressed the subject" (*News & Observer*, 22 February 1985).

The last major locus for creation-evolution conflict was the 1985 *Standard Course of Study*, a comprehensive public school curriculum guide for grades K–12, prepared by the Department of Public Instruction. Conservative Christians, led by Mrs. Ann Frazier, bitterly attached the *Standard Course of Study*, accusing it of being humanistic, antiChristian, antifamily, and antiGod. In its section on the science curriculum, the *Standard Course of Study* tip-toed around the creation-evolution controversy by avoiding explicit mention of the "E" word. Even so, it expressed its policy indirectly. One of its learning objectives was the concept that "Living things are a product of their environment"; also, its outlines of 8th grade and high school biology listed such topics as heredity,

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adaptation, uniformitarianism, tectonic forces, geological time, change through time, and fossils (DPI:1985). One of the conservative Christian critics, Marcell Souther, focused on its implied endorsement of evolution, which, she alleged, taught students that "they are animals." She continued,

> We ought not be surprised when students 'act' like animals and call their public school a 'zoo.' The message has gotten through to them, and they are behaving in a manner faithful to the concepts of those who conceived their education (*News & Observer*, 4 April 1985).

The State Board of Education was scheduled to endorse the *Standard Course of Study* in Spring 1985. Conservative Christians used concurrent legislative hearings on school funding as a forum to criticize the *Standard Course of Study*, with the hope that the legislature would then alter it to accommodate their complaints. Legislators listened politely to opinions like Souther's, then, after making a few minor changes, heartily endorsed the school funding plan without seriously altering the *Standard Course of Study*.

Discussion

Creationists in North Carolina preach and teach their message in conservative Christian institutions, and they maintain very close ties to the Institute for Creation Research. But they have been almost entirely frustrated in their mission of projecting creationism into the public school curriculum, which may seem puzzling, considering the statistics of creationist sentiment presented earlier. In trying to understand this, I see no compelling evidence that creationism's most vociferous opponents, including People for the American Way, the Committees of Correspondence, the local scientific societies, or the *News & Observer*, were primarily responsible for the defeat of the creationist agenda. Instead, I believe we can find historical causation in two other factors, *viz.*, public school policies for responding to complaints, and ironically, Southern Baptist values.

The good sense and effectiveness of the public school policies should not be underestimated. Schools can respond to reasonable concerns of parents without letting extremist critiques overwhelm them, precisely because grievants must be parents of children in the public schools; and because grievances must be both written and specific; and because the schools can devise solutions which minimize changes to the curriculum.

Regarding Baptist politics in North Carolina, it should be noted that the ideological center-of-gravity of the State Baptist Convention is *moderately conservative* as opposed to fundamentalist. Southern Baptists want the world to make sense morally, but few are so hostile to secular culture that they desire to change it radically. This is a critical distinction. In terms of evolution

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and creationism, this means that many Southern Baptists in North Carolina are uncomfortable with the materialism and determinism usually associate with evolution, yet most disavow the central claims of scientific creationism, e.g., that the Holy Bible deserves scientific corroboration.

Furthermore, the Baptist State Convention has a set of internal mechanisms which neutralize the denomination's views on many civic issues:

1. The principle of church-state separation, which is practically a Southern Baptist sacrament, discourages direct political involvement in all issues except drinking, gambling, and pornography. Fundamentalists cannot take it for granted that the State Baptist Convention will actively support their causes, even when many Baptists sympathize.
2. The principle of the autonomy of local congregations makes it impossible to compel individual churches to respect the resolutions that are passed at the annual meeting.
3. The increasing social diversity of Southern Baptists, with middle-class moderates countering the influence of lower-class traditionalists, drives the State Baptist Convention toward consensus and centrism.

Because of these factors, the State Baptist Convention is unable to commit itself to collective action on difficult moral controversies. It has passed some very conservative resolutions, including an endorsement of scientific creationism, but its conservative members cannot convert those sentiments into tangible political results, either inside the denomination or in the secular culture of state politics.

This situation is understandably frustrating to creationist and others of the New Religious Right, who expect Southern Baptists to be their allies. A frequent response is for creationists and other fundamentalists to depart from the SBC with bitter feelings, and to form independent fundamentalist churches which take firm stands on moral controversies. In fact, the New Religious Right in North Carolina, within which we can include the local Moral Majority and the local creationists, makes its home mostly in breakaway groups and autonomous congregations. I refer to this condition as inertia-and-centrifuge (Toumey 1987:477–495), that is, the ideological inertia of the State Baptist Convention, and the centrifugal reaction against that, such that creationists propel themselves to the periphery of the religious sector. This state's creationists find much comfort in the realm of ideological purity, but the more they direct their attention to religious groups that arise in schism and divide in more schism, the less are they able to organize support for an agenda of public school curriculum policies.

I believe that the public schools' habit of protecting themselves from bitter external assaults, and the SBC's tendency towards political centrism, together reveal an important feature of the sociological character of the

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creation-evolution controversy: we should avoid characterizing it as a struggle between liberals and conservatives, and instead should appreciate it as a tension between centrism and radicalism. Creationism's most serious obstacle is not a left-wing constellation embracing the ACLU, the NEA, and People for the American Way. Instead, it is the middle-of-the-road instincts of the people we call Middle America.

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Acknowledgements

I am grateful to the following people and organizations who supported my research: Sigma Xi; the Graduate School of the University of North Carolina: the University Research Council of UNC; and, the faculty development fund of the College of Wooster. I also want to thank Dr. Jane D. Brown of the School of Journalism at UNC for including questions on creationism and evolution in the Carolina Poll of October 1983. C/E

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A Response to James Lippard

Barry Price

In *Creation/Evolution* 29, pp. 9–21 (Winter 1991–1992) the new editor, John Cole, published "How Not To Debate with Creationists," by Jim Lippard. This article is objectionable to me and to Ian Plimer, Head of the School of Earth Sciences at Melbourne University (Australia), and a response is required.

In March 1990, partly as a result of a previous illness, I was forced to retire because of ill health. My book, *The Creation Science Controversy*, was published in April 1990. Ian Plimer handled for me the majority of the media interviews resulting from the unusually high publicity for such a book in a country where this controversy is very prominent.

The response of the Creation Science Foundation, Ltd. (the leading Australian creationist organization I had criticized) was to call the faithful to a national prayer campaign followed in September 1990 by publication of *A Response to Deception. An Expose of Barry Price's Book, The Creation Science Controversy*. October 1990 saw a second edition, and a revised edition was published in January 1991. This third edition was accompanied by a letter ordering all copies of the previous two editions to be destroyed.

In December 1990 Steven Gustafson, until 1986 a director of the Creation Science Foundation (and still a member), issued a defamation against myself, the publisher and printer of *The Creation Science Controversy* [i.e., a lawsuit]. The subject of the plaint is a minor editorial mistake which would normally require no more than an apology and correction. Gustafson refused to settle, and the matter remains *sub judice* [unsettled in the Australian justice system, a fact which limits published discussion in that country]. At present the CSF is being investigated by the Queensland Police Fraud Squad over

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their approx. $100,000 losses in the futures market in 1984. The details of this, as fed by the CSF to Lippard and reported by him, are incorrect and do not agree with CSF annual reports to the Australian Securities Commission. Lippard could have found this out for himself if he had researched his sources. Instead, Lippard merely accepted what CSF gave him.

At the beginning of 1991, Lippard wrote to me requesting me to answer a number of charges he thought would "stick" from the CSF booklet, *Response to Deception*, an attack on myself and my book. Lippard chose to ignore the dozens of lies, distortions, misquotes and defamations in their booklet. He also chose to omit that the first and second editions were ordered pulped because they contained major errors that allowed [Australian scientist] Alex Ritchie to charge Duane Gish with scientific fraud in the journal, *Australian Biologist*.

I stated my position on *Response to Deception* in a letter titled by the editor "A Matrix of Malice," referenced but not used by Lippard:

> *Response to Deception* is a pot pourri of scientific nonsense, defamatory falsehoods and personal abuse set in a matrix of malice. . . . There are no major errors by me.
>
> *University of New South Wales Alumni Papers*, March–May 1991, p.4.

I stand by that statement.

Lippard (*C/E*, p.12) gives a quick review of my book: "polemical, light on science and heavy on *ad hominem* argument." He quotes, unreferenced, from *Response to Deception*, "The creationist response correctly notes that Price's attack is largely not concerned with the realm of science."

Polemical. Unashamedly and deliberately so. It is designed as a weapon of attack and a means of defense against creation science, written for the lay person without scientific background but especially for parents and senior high school students.

Light on science. The real question is, is there enough science? More than half of *The Creation Science Controversy* is science, although without equations, because it is written for lay people. There is no mention of Darwin or neo-Darwinism, or of natural selection. The standard arguments of Gish, and he is markedly repetitious, are shown as sophistry, misquoting or just bad or even nonsensical. The same is done for Australian creationist leaders and the arguments current in their literature. The establishment of truth is by the destruction of error.

In doing this the mechanisms of evolution are discussed: chance, determinism, mutations, "switch on" genes, far from equilibrium thermodynamics, as well as holism, reductionism, order and disorder, the distinction between the laws of nature which may alter under circumstances and the

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universal constants which don't, etc. The Flood, continental drift and six day creation are given considerable attention.

Add to this that creationism is held only by those who believe in two ancient Near East myths, Enuma Elish (Six Day Creation) and the Gilgamesh Epic (The Flood), adapted by the writers of *Genesis* for their own religious purposes in about 450 B.C. Surprisingly, *Response to Deception* does not question the origins of *Genesis*. Their silence is acquiescence.

Response to Deception has very little to say on the science in *Creation Science Controversy*. An exception is in thermodynamics where Morris claims the first law was created on the seventh day when God rested and the second law 50 or 100 years later when Adam sinned. Chapter 10 of *CSC* uses a simple calculation (equations omitted) from classical thermodynamics to show this is such nonsense that it precludes any claim by creation science to be real science. Gish gets away with it all the time. *Response to Deception* (page 16, number 126) in response claims that a sort of "restrained" version of the second law was available before Adam sinned so that he was able to "digest a carrot."

It is in the physical sciences that creation science is most easily *seen* to be vulnerable by the general public. It has been said that eighty percent of the questions asked about the world by a child up to the age of twelve are in the area of physics.

Heavy on *ad hominem* argument. It is appropriate to let others answer this. The Appendix contains excerpts from a cross section of reviews.

Lippard's selectivity could be seen as quoting out of context on a large scale. What he leaves out approaches the breach of omission. His apparent bias is cause to wonder whose side he is on.

As the old lady said, "He is more to be pitied at than angered at."

Conclusion

The creationist lobby wave copies of Lippard's paper at every meeting and every opportunity. There is little doubt they have used it to damaging effect among their own kind.

Cole apparently does not feel an apology is necessary because he "published in good faith."

A comprehensive, referenced version of this paper which refutes every charge made by Lippard was submitted to Cole. The full length paper is obtainable from Professor Ian Plimer, Head of the School of Earth Science, University of Melbourne, Vic. 3052, Australia.

Appendix

Some review comments on my book:

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> This book exposes the cult for its pretense at being a science, while using the religious significance of the literal interpretation of the Bible as the cornerstone of its belief. . . .
> The documentation of the legal case at Livermore Elementary School in California illustrates the dangers of children being exposed to creation science material. . . .
> One of the best features of the book is the excellent reference list supplied as well as the identification of the identities in Australia connected with creation science. As Barry Price says, *"If the information in this book is effective in helping even one parent or child, it will have been worth the effort.*170 I recommend that parents and teachers read the book—forewarned is forearmed.
>
> *Journal of the NSW Independent Teachers Association*, 1990, ITA, p.21.

> If you seek a simple exposition of the facts about evolution which creationists do not like, or an orderly evaluation of the Biblical myths on which Western creationism is based, you can find them in Barry Price's book. Price exposes the deceit and trickery of both the Institute for Creation Research in America and the Creation Science Foundation in Australia. This exposure of the entire issue is comprehensive. . . . Price has said it all.
> The CSF uses rather more colourful language about Price's work. Some examples: "defamatory nonsense," "extreme sloppiness," "pygmy scholarship."
>
> *Australian Biologist* 4(1), March 1991

> A final message to outraged creationists: read the book. If you still want to ring or write, my mind remains closed to creationism, permanently. Inside, evolution rules. For the undecided, read: *The Creation Science Controversy*, by Barry Price.
>
> *The Age*, Melbourne, 28 April 1990

A comment in *Prayer News* (CSF), August 1990, p.2. can be summarized as follows:

> A national prayer campaign is called for, from August 'til the end of October. Readers are asked to "pray as often as you want but *especially* on Monday and Friday." Readers are urged to "Pray for [Price] and his main publicity agent and co-vilifier, 'Ian,' because "we wrestle not against flesh and blood but . . . against the rulers of darkness of this world, against spiritual wickedness in high places."

It should be apparent from the above that Lippard and CSF are a minority opinion. It is also apparent why the Creation Science Foundation has made such a major effort to suppress the book. In addition, for more than a year, NCSE offered my book for sale, as long as it was available, and even offered it as a premium to contributors. C/E

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Reviews

Darwin on Trial
by Philip Johnson. Washington: Regnery Gateway Publishing Co., 1991.

Reviewed by Eugenie C. Scott, and Thomas C. Sager, Esq.

The supposed virtues of looking at evolutionary biology through the eyes of a legal scholar show up frequently in newspaper reporters' discussions of *Darwin on Trial*. But why should we assume lawyers, rather than architects, would have a special insight into evolution, or science in general?

Science is a way of understanding natural phenomena. Law is a way of resolving conflicts, or controversy. The two disciplines have different goals. Now, it might be interesting to have a lawyer use the tools of his trade to resolve a controversy about, say, whether birds are descended from dinosaurs, or how much of the fossil record is explained by punctuated equilibria vs. gradualism, though because of differences between the approaches of law and science, nothing significant is likely to come of it. It would be fun entertainment, much as are the "Court of Historical Review" mock "trials" where it is "determined" in a court of law such things as who first discovered America.

These subjects are at least controversial. But Johnson is applying his controversy-resolving skills to a non-controversy. That evolution occurred is, in science (if not in the general public) no more controversial than that the earth goes around the sun. This is not to say that many people don't "disbelieve" that evolution occurred, but this view is either out of ignorance (the majority of the American public) or out of religious zeal (the "scientific" creationists). Johnson admits that the "critics" of natural selection he cites are not antievolutionists--yet he then uses their criticisms to try to disprove that evolution occurred. Whether evolution occurred or not is just not a debated question in mainstream science. But Johnson makes it appear that it is, and applies his forensic skills, inappropriately, to persuading us of this idea.

Science is played by rules that scientists have worked out over the years, and Johnson's rules are different. It is as if I and my colleagues are out on the field with our mitts and bats, and the pitcher is warming up in the bull

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pen, and Johnson comes out dribbling a basketball, demanding to play with us. Basketball is a fine game, but we're not playing that game, and if Johnson wants to play, he has to play by our rules.

His rules, as will be clear to anyone who reads his book, impose narrow Baconian, direct observational, direct experimental research design constraints on science, exactly as do the young-earth creationists. Unfortunately the general public, even more ignorant of the philosophy of science than is Johnson, is as Baconian as he is (or more so), finding perfectly comprehensible the accusation that "neither evolution nor creationism are scientific because no one was there to see it happen."

Law, Theory and Fact

Lawyers and scientists use many of the same terms but use them very differently. Words like "law," "theory," and "fact" provide some of the biggest differences, but by no means all. "Law," "theory," and "fact," are also used differently by members of the general public—further confusing the issue.

To modern scientists, the term "law" refers to a descriptive generalization, "theory" to an explanation of a phenomenon. Theories are more important than laws, because they are explanations of phenomena, rather than descriptions. Thus the Theory of Relativity is a "bigger deal" than the Laws of Thermodynamics, regardless of the usefulness of the latter.

"Law" in the legal profession, of course, means a body of prescriptive statements which regulate people's behavior. Laws are slow to change. Some of the legal statements that govern us in the US today, in fact, were first formulated in the 1300's. Laws are not to be broken; they have great status, and are not mere "descriptive generalizations" as they are in science. Members of the general public are more attuned to the legal than to the scientific use of the term "law." Most laypersons believe, erroneously, that scientific laws are more important than theories, that scientific "laws" cannot be "broken," and that a law, once established, cannot be altered: it is scientific "Truth."

Similarly, a legal "theory" differs from a scientific one. A legal theory refers to the approach used by a lawyer for analyzing or developing a particular case. It is based on relevant law, the facts of the case, an estimation of the opposing side's strategy, and the measures that can best be used to counter that strategy. A good lawyer may use a different "theory" for every case he tries, even if the "law" (e.g., a larceny statute) is the same. Theories are important tools in the legal profession, but they are tools only. Laws obviously are treated with more respect.

There are certainly some parallels between a legal theory and a scientific one. A scientific theory has to be based on "the law" in the sense that it builds upon already accepted theory, and the rules of logic with which component statements of a theory are related to one another. But from here on, things

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sharply diverge. In a lawsuit, a complaint is drafted, outlining a case, which includes a listing of "facts" which the lawyer will try to prove to the court's satisfaction. Facts create issues to be decided in the courtroom. Laws are applied to the facts to generate relevant conclusions; the practice of law, again, is to resolve conflict. In answer to the complaint, the other side either admits the facts, denies the facts, or leaves them for later argument. Once the defence has admitted that Mr. Boddy was found in the parlor with a lead pipe, then these facts are immutable and are no longer disputed.

Contrast this certainty with the impermanence of a scientific "fact!" Many scientists don't even use the Baconian word "fact" with its implications of certainty, and instead speak of "observations." Facts have the least "authority" of this fact, law, and theory triumvirate, whereas they are primary in law. A scientific fact, first of all, can (and does) change, which is definitely not the case with a legal fact, once agreed upon. It was a fact for over a decade, for example, that *Homo sapiens* had 48 chromosomes, though now we feel confident that there are 46. Facts also change with theories, because theories explain facts, and also change with new methodologies, themselves driven by theory. Furthermore, there is scarcely ever a situation wherein scientists on opposite sides of a theoretical issue will ever sit down and agree beforehand on what the facts are! Science, for good or ill, is a far messier process than law.

But creationists, ever the Baconians, criticize evolution for not being science because "we keep changing our minds about what happened." Johnson himself criticizes evolutionary biology for changing with new information, for example, accusing the supporters of punctuated equilibria of trying to "save" evolutionary theory when the fossil record "refuted" gradualism.

> . . . paleontologists clearly needed to find a theory that would allow them to report their projects as successful, but they felt constrained to operate within the boundaries of the neo-Darwinian synthesis. What was required was a theory that was saltationist enough to allow the paleontologists to publish, but gradualistic enough to appease the Darwinists. Punctuated equilibrium (*sic*) accomplishes this feat of statesmanship by making the process of change inherently invisible. You can imagine those peripheral isolates changing as much and as fast as you like, because no one will ever see them" (p.61).

He doesn't quite "get" punctuated equilibria, but what I want to focus on instead in this passage is his profound misunderstanding of how science works.

In science, it's OK to change your mind about an explanation if you get new data, or if you are able to look at old data differently. It's *expected*. The goal is explanation through theory, and as mentioned before, we know enough about the fallibility of empirical explanations to realize that "truth" is only a goal.

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The differences in the use of the term "fact" offer an exceptionally sharp contrast between the legal and the scientific use of terms, and these differences show up clearly in Johnson's book.

The use of the term "theory" in law points out clearly to us laypeople the adversarial nature of law. The game, after all, is for my champion to get on his horse and ride against your champion, and the most skillful proxy wins. Although science (and scientists) can certainly be adversarial, the nature of competition among scientific ideas contrasts sharply with competition between lawyers in a legal setting. A defense attorney, for example, is careful to present his client in the best light possible. Defense attorneys work hard to keep unsavory aspects of the client's past or character from being revealed to the jury. But where a lawyer would seek to avoid presenting his client's warts, in science, the best way to defend a scientific theory is to present not only the supporting data, but also to seek out the best arguments possible to *refute* an explanation. The best theoretical presentations include "my explanation would be wrong if . . . " sorts of statements, as did Darwin regarding natural selection in *The Origin of Species*. The scientist who conceals flaws in her theory is eventually going to lose, because someone else will ultimately expose them. In science, we publish our conclusions, which means we hold them up for later analysis.

"Truth" is something modern philosophers of science are very cautious about, tending to claim, in this post-Baconian world of ours, that "truth," is not something we can count on as permanent. We recognize that our explanations for natural phenomena may change; we do not assume that we have the "true" explanation. We are more confident or less confident about our explanations, rather than considering them "True" with a capital "T". We are quite confident, for example, that the earth goes around the sun, and that evolution took place, but we are less confident about how much of evolution punctuated equilibria theory explains compared to other models, or what precisely was the role of Neandertal genetic variation in modern European gene pools.

Ashley Montagu (1984:9) remarked that "The scientist believes in proof without certainty, the bigot in certainty without proof." Whatever you think of his comment about creationists (and he was describing the young-earth, Biblical literalist creationists rather than using Johnson's sweeping definition of anyone who thinks God created), he accurately reflects the tentativeness of modern science.

But "truth" in law is an absolute; either a witness is telling the truth, or not. And, in a court of law, if it can be shown that part of a witness's testimony is false, then the judge can tell the jury to discount the *entire* testimony. Johnson, as a prosecuting attorney, falls naturally into this form of argumentation in his treatment of natural selection and other issues, as well. If natural selection is faulty, then evolution must fall; this omits the fact that natural selection is not the only conceivable mechanism for evolution. Here again, the general public

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is more attuned to a lawyer's way of thinking than to a scientist's. Time and again in creationist literature one encounters the assumption that if some small observation is not accounted for by the theory, then the whole theory must go, regardless of how many *other* observations are explained by the theory, and regardless of how well the theory fits with other theories. Scientific creationists have, in fact, made a specialty of locating imagined "problems with evolution" and using them in creative ways to discredit the whole picture of descent with modification. If anatomist Charles Oxnard claims that the Australopithecines were not bipedal in the same way that modern humans are bipedal, then creationists distort his conclusion to say that there are no transitional human fossils. Therefore evolution did not occur. Never mind that whether or not Australopithecines are ancestral to modern humans has no bearing on whether *Homo erectus* or Neanderthals are. One cannot refute an entire evolutionary picture upon finding that one of the pieces of the puzzle was temporarily put in upside down.

Ecological Niches

Linguistic differences aside, it is also true that lawyers and scientists do very different things for a living, and consequently have a rather different world view. The job of a lawyer is not to find the truth, (that is the job of the judge or jury) but to defend (or prosecute) the client. Let us develop that idea a little further.

The jury or judge (known as the "fact finder") has the job of resolving the disposition of disputed facts—what "really happened." And by law, what "really happened" is what the fact finder *concludes* happened. In this resolution, many factors play roles. The background of the fact finder as well as the empirical evidence (and the skill of the lawyers) determine which facts are "true." In Spring 1992, a jury of mostly middle-class whites decided in the Rodney King case that a group of white officers did not use excessive force in a beating of a black man stopped for a traffic offense. The empirical evidence included a videotape of the incident showing multiple blows to King after he was subdued. But as is clear in this case, the picture in the jury's mind was extremely important, rather than any Aristotelian *eidos* of what "really happened." It is clear that these fact finders brought with them to the decision considerable beliefs about the nature of police work, and the behavior of accused individuals of a particular sort. These beliefs were exploited skillfully by the lawyers for the accused—more skillfully than by the lawyers for the prosecution.

A lawyer doing his or her job will strive to bring the jury to the client's side. If the lawyers for the accused in the Rodney King case had done less, they would have been guilty of ethical violations. The standard is to vigorously argue on behalf of one's client, rather than to pursue an abstract "truth" or even "justice."

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This is not a criticism of our legal system: we believe that the accused is innocent until proven guilty, and that even those accused of the most heinous crimes deserve defense. In supporting the client, the lawyer may use any ethical means available. It is perfectly ethical for a lawyer to make *ad hominem* attacks on the opposing witnesses, to present incomplete information to a jury, to bring in irrelevant data, and of course to use a wide panoply of rhetorical skills and tricks. Science, obviously, has different goals. But the lawyer's orientation should be kept in mind when analyzing Johnson's book, because he is a lawyer, he has titled his subject a trial, he pursues it as a trial, and his job is to prosecute Darwinism. Lots of things are "fair," from his point of view.

A good way for a lawyer to get the upper hand in a trial is to be sure that the definition of terms and description of events are shaded in one's client's favor: the creation of "strawmen" appears to be fairly common in trials and during depositions. Thus Johnson defines terms to best suit his purposes. He uses "creation-science" to refer to the young-earth, six day creation variety, with which I would agree, but then seizes other vital terms for himself (p.4):

> "Creationism" means belief in creation in a more general sense. Persons who believe that the earth is billions of years old, and that simple forms of life evolved gradually to become more complex forms including humans, are 'creationists' if they believe that a supernatural Creator not only initiated this process but in some meaningful sense *controls* it in furtherance of a purpose. As we shall see, 'evolution' (in contemporary scientific usage) excludes not just creation-science but creationism in the broad sense. By "Darwinism" I mean fully naturalistic evolution, involving chance mechanisms guided by natural selection.

His "creationists" would thus include "theistic evolutionists," and he deliberately sets up evolution and Darwinism as anti-religious entities in the reader's eyes. Actually, evolution, Darwinism (evolution by natural selection) and science itself are no more irreligious than long division. But *Darwin on Trial* would make no sense if theologically-neutral definitions were used.

Johnson uses these courtroom techniques in a "you can't win for losing" attack upon evolution. As a good lawyer, he creates doubt in the jury's mind. He will at length portray negatively some element of evolutionary theory, only to quietly admit later (after the doubt is sown) that the situation isn't exactly like that after all. He discusses how natural selection has been accused of being tautological, but then eventually admits that it can be formulated in such a way that it is not. By that time, however, (especially in the mind of the nonspecialist to whom the book is directed) the damage has been done.

A related legal maneuver is to add new criteria for evaluation if things are going badly for your side. So he argues that natural selection cannot produce new species, only to admit later that there are some cases where it looks as

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if indeed, natural selection *has* produced new species. Quickly he changes the criteria: even if it could be shown that natural selection can result in speciation, this wouldn't prove that natural selection could produce the whole tree of life!

This "add a new criterion" approach is especially prevalent when Johnson must deal with strong evidence for evolution. In lawyerly fashion, he generates the question in the reader's mind that something is fishy in the evidence, only later to admit that the evidence actually supports the evolutionist. But then he quickly slips in new criteria so that the anti-evolutionist position reigns at the end.

For example, in several passages he denounces the idea of transitional fossils. One of the most elegant transitional fossil series is the evolution of the mammalian jaw (S. Gould, An Earful of Jaw, *Natural History* 3 p. 12ff., March 1990), and even Johnson calls it "the crown jewel of the fossil evidence for Darwinism" (p.75). (Actually, it is a "crown jewel" of evidence for evolution, rather than specifically the Darwinian mechanism, but here again Johnson confuses the two.) Johnson grudgingly admits that transitional fossils do exist to bridge the gap between reptile and mammal jaw types, but then denies that this proves evolution from the one to the other.

> "On the other hand, there are many important features by which mammals differ from reptiles besides the jaw and ear bones, including the all-important reproductive systems. As we saw in other examples, convergence in skeletal features between two groups does not necessarily signal an evolutionary transition" (p. 76).

But unfortunately for Johnson, although the reproductive system is not one of them (fossil uteri?), extra-mandibular structures showing intermediacy between reptiles and mammals *do* exist in the fossil record, which Johnson later is forced to admit. "It seems that the mammal-like qualities of the therapsids were distributed widely throughout the order" (p.76). Lest the reader now be persuaded that maybe evolution is OK after all, Johnson swiftly counter-punches. All the subgroups "are mutually exclusive as candidates for mammal ancestors. An artificial line of descent can be constructed, but only by arbitrarily mixing specimens from different subgroups" (p.77).

The presence of intermediates, even extensive intermediates like those between reptiles and mammals, isn't sufficient to demonstrate evolution without new criteria being added. Johnson, like the creationists, insists on our showing the full range of fossil intermediates between two modern taxa: 80% reptile and 20% mammal, then 75% reptile and 25% mammal, and on and on.

Similarly, Johnson takes on the fossil whale, *Basilosaurus*, a particularly exciting fossil that not only has legs (found in other fossil whales, and even

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occasionally as vestigial structures in living ones) but actually has rudimentary *feet*. But whereas an evolutionist would hardly seek to find better evidence that whales are descended from terrestrial quadrupeds, Johnson briskly adds the requirement that we also provide him with evidence of step-by-step transitions between quadrupeds and whales that "permit deep diving, underwater communication by sound waves, and even to allow the young to suckle without taking in sea water." Well, when we find fossil uteri, perhaps we will also find evidence for fossilized underwater nursing. As in the old song, "Tell him to buy me an acre of land/Between the salt water and the salt sand." Johnson demands of us the impossible, but it reads quite well to the uninitiated.

Another classic example of his "you can't win for losing" style of argumentation is his treatment of the fossil reptile/bird intermediate, *Archaeopteryx*. Even if we found an unmistakable intermediate, which he admits the bird-like *Archaeopteryx* is, he still is not satisfied, and throws in another criterion before evolution can be accepted.

> "Possibly birds did somehow develop from dinosaur predecessors, with *Archaeopteryx* as a way station, but even on this assumption *we do not know what mechanism could have produced all the complex and interrelated changes that were necessary for the transformation*" (italics mine) (p.79).

No matter how fine the transitional form, he will not accept it unless we meet his demand for a complete explanation (from genetics? where?) of precise mechanisms *producing* the change!

All this sounds a bit shady to those of us outside the legal profession, but rhetorical tricks like these are considered perfectly ethical and in fact, are part of the responsibility of a lawyer to his or her client. Indeed, the stakes are high. Once the guilty or innocent decision is made by the judge or jury, and once the appeals are exhausted, that's the end of it. The judgement is collected and put in the bank, the client goes to prison, or maybe goes to the electric chair. The stakes are high in a legal case, and you want your champion to defend you to the best of his ability.

In science, there is never this finality of decision. The open-endedness of scientific discovery, the fact that we change our explanations, means that we can say that we are, indeed, *searching* for truth, though we are cognizant that at any given time, we might not have it, and in fact, may change again our ideas at a future time. In fact, in science, the tendency is that one never wins for long. Look at Piltdown: the conclusion that this specimen was an early human didn't last past the 1950's. One's conclusions are always subject to revision in science, which contrasts sharply with the situation in law.

I [ECS] recall when I began teaching anthropology that the big issue in paleoanthropology was the "single species hypothesis" that only one homi-

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nid ever lived at one time. I recall, also, that its strongest proponent, Loring Brace, cheerfully admitted (or as cheerfully as one can, when one has spent 10 years of one's life promoting an idea) that the hypothesis was no longer valid after the discovery of critical fossils in East Africa. And more recently, the "out of Africa" interpretation of mitochondrial DNA data analysis has been called into question. The proponents of "African Eve" graciously admitted their computer algorithm was wrong. Back to the drawing board. Scientific explanations are not permanent. And only if you are an old-fashioned Baconian scientist, three hundred years out of date, is this worrisome. Unfortunately, most non-scientist Americans do not understand this basic fact of 20th century science. And few lawyers are scientists.

A final difference between law and science remains to be discussed. Of course scientific explanations (theories) change with new data, or new ways of looking at things. But explanations are changed when *better* explanations are proposed. One cannot expect one's colleagues to give up an explanation that "works" without providing an alternate explanation that explains all the phenomena explained by the old theory, and goes beyond to solve new problems.

Law has no such constraints. A lawyer only has to get his client off; he doesn't have to prove the butler did it. So Johnson takes great pride in denying that he is proposing an alternative to Darwinism. It is sufficient to him that he merely prosecutes Darwin; he is, after all, a lawyer. But he is not going to persuade scientists that way. In science, if you are going to challenge the reigning paradigm, an established theory that explains enormous numbers of observations and ties in with numerous theories across several scientific fields, it behooves you to find something to replace it. The problem with insufficient numbers of neutrinos did not cause the Big Bang to be rejected; but if someone could come up with an explanation that explains as much as the Big Bang does, *plus* explains the number of neutrinos, then the Big Bang would be history. But one cannot just cry, "The Emperor has no clothes" in science: by our rules, you have to provide at least a bathrobe. If Johnson doesn't like it, let him take his basketball elsewhere.

Given these differences between law and science, I conclude that it is no special advantage for a lawyer to "take on" evolution, any more than it is an advantage for a hairdresser or a ballet dancer. Law is a fine and noble profession, but just because someone from a prestigious profession ventures out of his realm, doesn't mean we should take what he says seriously! The criterion for whether an outsider should be taken seriously as a critic of a field is knowledge about the subject. Does Johnson understand enough about evolution to be taken as a serious critic? The answer is no. He re-warms some old criticisms of the creationists, but adds nothing except rhetorical excess. And, of course, the creationists have been answered at length for several years now.

This is not to say, as Johnson does repeatedly, that evolutionary biology is closed to criticism. We no more question whether change has taken place

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during the history of the universe than we question heliocentrism. But there are marvelous controversies about exactly what happened in evolution, which species is related to which, what the history of life entailed, and, especially, the proximate (not ultimate) mechanisms bringing this change about. How adequately does microevolution explain macroevolution? Are new mechanisms needed? How relevant are heterochrony and other ontogenetic processes to evolution? How much of evolution is explained by gradual vs. rapid evolution? What is the nature of species? Are they natural groups? Individuals? Or something else? Molecular taxonomy works; how about the molecular clock? How does cladistic systematics make us look at phylogeny? What causes extinction? To the degree that Johnson deals with any of these issues, he deals with them most superficially and misleadingly. Too bad. A student reading this book will come away with the idea that there is some sort of stuffy scientific establishment proclaiming an orthodoxy, against which no one may struggle. How wrong he is! And how dynamic—even scrappy—the field of evolutionary biology is!

Ed: This is an excerpt from a longer review by the authors; other sections deal with Johnson's shaky biology and his critique of philosophical materialism, and we hope to publish these other installments in a future journal issue.

Evolution: The Challenge of the Fossil Record

by Duane T. Gish. El Cajon, CA: Creation-Life Publishers, 1985. 277 pp.

Reviewed by John Cole, University of Massachusetts, Amherst, MA

This is an updated version of Gish's two best-sellers, *Evolution: The Fossils Say NO!* (regular edition and public school version). The updating is cosmetic. The new subtitle takes even more chutzpah than the first version's, since the fossil record is such a challenge to creationism, but it is indeed Gish's focus in this as well as the earlier editions.

It is daunting to try to review a book which is rife with error and misunderstanding on every page. By sheer number of factoids in an avalanche, the author tries to convince the reader that a sound case is being made because no one has the energy to dissect the book, line by line; certainly, I don't! A thorough "review" of this laundry-list of claims and assertions is, in a way, the mission-impossible of *Creation/Evolution* journal and various book-length critiques of "scientific" creationism. Besides a blunderbuss,

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scattershot approach, a second Gish tactic is to cite a respected scientific position and simply declare it wrong on the face of it.

Let me choose random pages. P.80 cites an interview with scholars about fossil cetaceans and then asks questions about what wasn't covered: were the bones all from one individual? Even the same species? The paleontologists could have answered these and other questions, but they were asked rhetorically by Gish, not by the original interviewer, so scientists are recorded as mute on such questions. Gish happily quotes bits and pieces of various evolutionists's writings, as before. He "explains" that radiometric dating just doesn't work. He harps on the supposed absence of transitional fossils even while listing a few of them. For example, Australopithecines, "Java Man" and "Peking Man" are dismissed as apes, while Neandertals are called fully modern (pp. 203 ff.). Gish (pp.185 ff.) repeats the claim that all "Peking Man" remains are lost and only known by hearsay; in fact, a number of specimens have been found since WWII at the same site near Peking, and the "lost" fossils were carefully photographed, measured and documented. *Archaeopteryx* is just a bird (p.110) or just a reptile (pp.110-111), not transitional. Thus (and typically), fossils which contradict Gish's claims are used as if they prove him right.

Gish cites allegedly contradictory dates for various fossils and various strata and concludes that since scientists can't agree on anything, he'll step in with his better explanation, but as usual, he picks and chooses to build strawmen to attack and then flails away with his "simple solution." He wrongly equates "catastrophism" with "creationism" in order to claim the scientific credentials of catastrophism (new and old). Any disagreement with natural selection, the modern synthesis, or any specific fossil or geological detail become, in Gish's hands, attacks on the whole fabric of evolutionary theories and de facto support for creationism, which he falsely treats as the only alternative to evolution. Gish misconstrues statements by Gould, Simpson, Stanley, Raup and many others even though by the time this "new" edition was published he had been corrected in person and in print, so ignorance is no excuse (if it ever was). And so forth, page after page, Gish summons up examples of this and that researcher and then dismisses them as simply wrong, as anyone with half a brain can recognize for themselves. He uses a sort of inverted appeal to authority by showing how silly and pointless is the life work of each scholar cited. He feigns complex understanding by using strings of complicated words ("meningocele, spina bifida, chondrodystrophy, cleft palate, hemangiomas, syndactyly, hypodactyly, and heterotopic anus," for example, on p.220—a list of birth defects which is quite daunting to see, however meaningless to any argument being made).

Gish writes about origins of races, languages, "tribes," etc. in the eight survivors of Noah's ark, discusses where Cain and Abel got wives, and otherwise deals with Bible issues more openly than the "school" version of his earlier book.

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The first version(s) of this book are among the most widely quoted creationist sources, and this version may catch up, given time. Unless you're a debater, though, you probably don't need a copy of this rehash if you already have the original hash. But if you are involved in science or religious education in any way, you should read one of these Gish books if you want to understand what arguments scientists and theologians face in classrooms and churches—arguments which a few educators try to counter-act via NCSE. C/E

Correspondence

• *In C/E 29 (Winter 1991–'92) Jim Lippard refers to a disagreement in Australia between Ian Plimer and Duane Gish over Michael Denton's book, Evolution: A Theory in Crisis. Lippard criticizes Plimer's "remarks" and tentatively attributes them to me: "A possible source of Plimer's remarks (or perhaps they share a common source) is Stan Weinberg's (1985:22) report in the Creation/Evolution Newsletter" (Weinberg, 1986, "Creation-Evolution Literature from Australia," Creation/Evolution Newsletter 6(6): 20–22).*

Lippard's attribution is without foundation. I had no communication with Plimer while he was having discussions with Gish and Denton or while I was writing my article. My information came from Michael Archer, who knew Denton quite well.

I have recently talked with Plimer [Summer 1992]. He also bases his evaluations on Denton's book and on face-to-face interviews with [Denton]. Plimer tells me that he never said Denton "knows nothing" of fossils or mammal-like reptiles. Plimer did sense—and say—that Denton's knowledge in these areas seems to be recently-acquired and very weak. Plimer also reaffirmed, quite emphatically, Denton's statement that he knew very little about these areas when he began his writing, and he would have written his book quite differently had he been better informed.

As you already know, Plimer feels the Lippard article is a shoddy job, poorly written and edited, and weak in research. I concur; Creation/Evolution deserves better.

Stanley L. Weinberg
Ottumwa, Iowa

Ed: This matter is addressed in this issue by Barry Price in a reply to Lippard. Dr. Ian Plimer, to whom Weinberg refers, is Head of the School of Earth Sciences at the University of Melbourne; he assisted with Price's reply article.

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3. An original and two copies should be supplied by the author. Copies will be sent to referees for evaluation with the author's name omitted. Ideally, manuscripts should be submitted on computer diskette in DOS (standard or high density 5 1/4" or 3 1/2") in WordPerfect 4.0-5.1, WordStar 3.0-5.5, or ASCII formats).
4. Reference sections are alphabetical, follow the main text, and should conform to the following sample for either books or periodicals:

   Smith, Fred Z. 1982. "Geocentrism Reexamined." *Journal of Nice Things* 21(3):19-35.

   Zubrow, Ezra 1985. *Archaeoastronomy.* Orlando, FL: Academic Press.

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